

# **The Protection of Cultural Resources Against The Hazards of War**

**A PRELIMINARY HANDBOOK**

*Prepared by the*

**COMMITTEE ON CONSERVATION  
OF CULTURAL RESOURCES**

**NATIONAL RESOURCES PLANNING BOARD**

**WASHINGTON ; FEBRUARY 1942**



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## PREFACE

The Committee on Conservation of Cultural Resources was established by the National Resources Planning Board in March 1941 to collect and disseminate information and promote measures for the protection of books, manuscripts, records, works of art, museum objects, historic buildings, scientific and scholarly apparatus, and other cultural resources against the hazards of war and to formulate long-range plans for the conservation and broadest and wisest use of cultural resources. It has also undertaken the specific function of preparing plans for the protection of materials of cultural, scientific, or historic importance in the possession of agencies of the Federal Government. In its relations with State, local, and private custodians of cultural materials, the Committee functions principally through State committees on conservation of cultural resources, which have been established in almost every State.

The present handbook is based on a preliminary discussion of the conservation of cultural resources in time of war prepared by Richard H. Heindel, formerly Executive Secretary of the Committee on Conservation of Cultural Resources, and distributed for discussion purposes in May 1941. The text was later revised by Robert Bahmer and other members of the staff of The National Archives to take into account the comments made on the preliminary discussion and the changed situation brought about by the outbreak of war. The text has been further edited by Dan Lacy, Secretary of the Committee, and by the Division of Information and Publications of The National Archives. Chapter IV, on the Protection of Buildings, is almost entirely the work of members of the National Park Service of the Department of the Interior. In the preparation of the handbook, extensive use has been made of the publications of the Office of Civilian Defense and of British and European publications. The bibliography is based on that in *The Care of Records in a National Emergency*, National Archives Bulletin No. 3. The text of this bulletin was prepared by the Committee on the Protection of Archives Against Hazards of War and the Committee on the Emergency Transfer and Storage of Archives of the Society of American Archivists as a joint report to the Society. The report was made available to the Committee on Conservation of Cultural Resources for use in its work, and much in the present handbook has been taken from it.

The members of the National Committee include the Librarian and Chief Assistant Librarian of Congress, the Archivist of the United States, the Executive Officer of The National Archives, the Director of the National Gallery of Art, the Associate Director of the United States National Museum, the Commissioner of Public Buildings, the Supervisor of Historic Sites of the National Park Service, the Director of the American Association of Museums, the Executive Secretary of the American Library Association, the Director of the American Council of Learned Societies, and representa-

tives of the Committee on Passive Protection Against Bombing, the American Institute of Architects, the War Department, and the Office of Civilian Defense.

The Committee has initiated a survey of space suitable for the temporary deposit of cultural materials removed from areas of danger, which is being made by the Historical Records Survey of the Work Projects Administration. It is in contact with the best sources of information in the Federal Government and will be glad to give any assistance it can by way of information or advice toward the protection of cultural materials in the possession of any person or institution. Communications to the Committee should be addressed to Collas G. Harris, Chairman of the Executive Committee, National Archives Building, Washington, D. C.

This handbook treats only the protection of cultural materials. For guidance in the protection of staffs and visitors from air attacks, directors of libraries, galleries, museums, and archival agencies should rely upon the local civilian defense organizations.

WALDO G. LELAND, *Chairman,*  
*Committee on Conservation*  
*of Cultural Resources.*

APRIL 15, 1942.

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## CHAPTER I

### THE ROLE OF LIBRARIES, MUSEUMS, AND ARCHIVAL AGENCIES IN WARTIME

In periods of grave national danger, libraries, museums, and archival institutions have the opportunity to increase their value to the people and the duty of fitting themselves and their activities to the special wartime needs of the Nation. It is therefore important to determine which of the normal functions of such institutions should be continued during wartime and what additional activities or functions should be undertaken. Unless a decision is reached on these matters, no realistic plans can be made as to basic needs and necessary precautionary measures, as any plan for protection must necessarily be fitted into the larger plan for service.

Fundamentally, executives of such institutions are confronted with a choice between the maximum use and the maximum protection of their collections. A practical working formula embodying a compromise between the two extremes of complete use and complete protection can and should be devised to suit the individual problems of each institution.

European experience has demonstrated beyond doubt that libraries, archival institutions, and museums have important functions to fulfill in connection with a nation's war effort, both from an immediately practical standpoint and from the long-range point of view as aids in the maintenance of national morale. The imposition of a complete blackout on such institutions in many cases not only deprives a nation of sources of information vital to its military program but dries up the wells from which the national spirit is strengthened and replenished. Hence complete evacuation or suspension of all activity is not to be contemplated except in cases of extreme danger. Collections should certainly not be placed in dead storage when they are being used in connection with research projects related to the war, and every effort should be made to keep holdings available even for other kinds of research work. Similarly, galleries and museums, though they may evacuate their most treasured materials, should be able to continue exhibitions of those parts of their collections that, though of secondary value, are definitely of public interest. This implies that, though protection may be given to such materials as continue in use, it should not be of a type as to make them inaccessible. It is possible, of course, that protective measures may make the use of certain materials by the general public impossible, although they remain accessible to the staff. Special thought and care may well be given to the protection of administrative records. British libraries have suffered seriously from the destruction of records of outstanding loans, histories of accessions, and similar files.

There may be permanently valuable byproducts of these activities. The necessity of evacuating art objects from hazardous areas may afford the more remote but less affluent sections of the country a welcome opportunity to benefit from their presence. The micro-filming of archives, manuscripts, and rare books and the preparation of measured drawings of historic buildings will be of lasting benefit.

A number of special responsibilities devolve on the executives of cultural depositories in time of war. Since many valuable collections and historic structures remain in the hands of private owners who may not be fully aware of the hazards of war, the directors of public institutions ought to attempt to arouse private owners to dangers that may exist and to offer all possible assistance to the many individuals who have requested aid in protecting records, books, art objects, and historic monuments.

The executive of each institution ought to define for himself or have his governing board define for him the extent of his powers and responsibilities in connection with such matters as gifts, loan exhibits, deposits, memorial rooms, and other property to which the institution does not have full title. Owners of objects on loan in depositories should be notified of any special measures taken to protect them.

A well-organized safety program should be set up in each institution as soon as possible, in which each member of the staff, after having been assigned a definite task to perform, is trained in its special problems and responsibilities in connection with the protection of collections against all the hazards of bombing or fire. The entire staff should participate in the program and each member should know precisely what is expected of him the moment an emergency arises. In large establishments this type of work may probably be performed best by squads, each operating under a leader whose previous training or experience particularly qualifies him for a special type of work, such as dealing with incendiary bombs or rendering first aid.

When the entire plan has been completed and tested by means of drills, it is wise to put in writing the manner in which it will function, thus permitting individuals to understand the relationship of their assignments to the protection program as a whole. In connection with the preparation of such a master plan, estimates should be made of the amount of time that will be necessary for the performance of particular parts of the program, such as the evacuation of personnel from an area, the transfer of fire-fighting equipment, and similar activities.

Consideration should be given to the feasibility of rendering aid to nearby private institutions whose staffs or resources are not such as to enable them to cope successfully with the dangers that their collections face. Decisions should be made in advance of the actual emergency, if possible, on precisely how much aid can be given and the character of such aid. Having an advance understanding on such matters will enable the chiefs of private institutions with small staffs to formulate effective and intelligent plans for the protection of their own materials. Similar assistance, if possible, should be given whenever needed to local officials having the custody of important public records.

In all problems of this kind, one of the first and most basic considerations is the financing of special precautionary measures. All such measures cost money, and it will be the universal desire to keep expenditures at the lowest possible figure consistent with maximum safety. If effective protection on the spot can be given more cheaply than protection by evacuation, evacuation need not be resorted to. If bombproofing can be so arranged as to protect both the staff and the collection, separate plans for the protection of each are not necessary. These considerations vary so widely from one institution to another that all that can here be said is that each director should give careful thought to his own problems and bear always in mind the basic principle that his collections must not, during the hurry or excitement of an emergency, be left to the mercies of untrained persons.

While it is the purpose of this handbook to discuss only the protection of cultural resources and not the more general functions of cultural institutions in time of war, it is perhaps not amiss to point out that, in addition to the other difficulties that are imposed, the war increases greatly the demands upon museums, art galleries, libraries, and archives and opens to them broad new fields of service. Every opportunity should be grasped to enlarge the contributions and vitalize the services that such institutions can offer not only to educational and research needs but to civilian morale. The rearrangement of holdings affords the chance to install new and timely exhibits. The thousands of workers who have been pouring into industrial and governmental centers constitute a new group to be reached by the services of galleries, museums, and libraries. The added urgency that has been given to research in many fields by the necessities of war provides increased opportunity for cultural institutions. Readings and educational exhibits related to civilian defense will be most useful. More needed now than ever is the continuing service of libraries, museums, and art galleries in providing intervals of surcease from the strain of wartime activity.

It is essential that the ideal of protection, basically important as it is, should not be allowed to obscure the ideal of service.

## CHAPTER II

### HAZARDS OF WAR TO WHICH CULTURAL RESOURCES ARE EXPOSED

The hazards of war to which cultural resources of the country are exposed arise in part from enemy action and in part from the pressure of emergency activities. The latter are less spectacular than the dangers from bombing or invasion and are doubtless less present in the minds of the public and of many curators of cultural materials, but they probably constitute an even more serious threat than does enemy action at the present time.

Among the principal dangers resulting from the pressure of emergency activities are:

1. The destruction of important records and manuscripts that may occur in intensive campaigns for the collection of waste paper.
2. The discarding or removal to improper, crowded, and dangerous storage space of records, books, and other cultural resources because of pressure for office space.
3. The depletion of the budgets and staffs of cultural institutions below the point at which adequate protection and custodial care can be given, especially in view of increased demands that are likely to be made on such institutions.

Vigilance and an active effort to awaken public officials to the value of cultural materials are perhaps the best protection against the first two of these dangers. As to the third, cultural institutions must, of course, like all others, expect to make sacrifices of funds and personnel to the prosecution of the war; and the ingenuity of the directors of the institutions should be exercised to insure that these sacrifices will not endanger the integrity of their collections or impair the quality and extent of their services.

The hazards from enemy attack will vary greatly in the different parts of the country and at different stages of the war and are indeed impossible to calculate with exactness even for a given time and place. Such hazards may be produced by invasion, bombing, or sabotage by enemy agents. Sabotage is unlikely to affect cultural institutions; the danger, or at least the immediate danger, of invasion may perhaps be discounted at the present time.

The hazards of bombing attacks constitute a present menace, however. On the basis of the best information available in early March 1942, those areas of the continental United States within roughly 100 miles of any coast or border are exposed to air attacks. Such attacks on large coastal cities and other prominent military objectives near the coast are likely to occur. From bases the enemy is now known to possess, it is unlikely that such attacks could be made in sufficient force to cause extensive damage to nonmilitary buildings by direct hits or blasts from demolition bombs. The possible use of incendiary

bombs does create, however, a considerable menace to cultural resources through fire. This hazard is sufficiently great at the present time, in the opinion of the best authorities available, to justify the removal to places of safety of small quantities of irreplaceable materials of the highest cultural, scientific, or historic importance now located in the zones of danger as defined above but probably not sufficiently great to justify any major or public evacuation of large quantities of material. If bases closer to the United States fall into enemy hands, or if the design and capacities of long-range bombing aircraft are further improved, both the geographic extent and the degree of menace from enemy attack will, of course, be correspondingly increased. Assurance cannot be given that information of changes in the military situation will be available sufficiently in advance to allow time for putting into effect extensive protective measures not undertaken or arranged for now.

Bombs are usually directed against specific military objectives, such as air fields, navy yards, military posts, troop concentrations, coast defense units, arsenals, munitions depots, factories, ship yards, oil refineries and storage centers, communication centers, key highways, dams and bridges, important Government offices, and transportation, utility, power, and telephone stations. It is to be expected that any hostile attack on the United States will be directed against objectives of supreme importance, because of the relatively small bomb-load that can be used under present circumstances. Institutions situated near such objectives are in special danger.

It cannot be assumed, however, that institutions removed from such objectives are entirely safe. Bombing is often quite inaccurate, especially when the bombs are released at high altitudes, and institutions 2 or 3 miles from an objective may be hit. Also there is the possibility of indiscriminate bombing, especially with incendiary bombs, which may be employed in an effort to undermine morale or to create a civilian demand for the dispersion of the air force to protect individual cities. Such bombing would subject to hazards all institutions in the larger cities in the coastal and border areas, even though they may be quite far removed from specific objectives. Pilots who have failed to locate a desired objective may drop their bomb-loads indiscriminately even on smaller towns. Though an institution may escape all hits entirely, it may still be seriously endangered by fire spreading from other buildings that have been struck by incendiary bombs.

A somewhat more detailed treatment of the various types of bombs and the probable destructive effects of each is given in Chapter IV, *The Protection of Buildings*.

Future changes in the military situation may be expected, and each person responsible for the protection of cultural resources should maintain his own currently revised estimate of the particular military hazards to which his own holdings are subject. Though in forming this estimate he must rely in very large part on information generally available through the press, the Committee on Conservation of Cultural Resources will transmit to State committees from time to time recommendations based on the best information available to it. The Army maintains nine corps area headquarters at the following addresses:

- I. Boston Army Base, Boston, Mass.
- II. Governors Island, N. Y.

- III. United States Post Office and Court House, Baltimore, Md.
- IV. Post Office Building, Atlanta, Ga.
- V. Fort Hayes, Columbus, Ohio.
- VI. Post Office Building, Chicago, Ill.
- VII. New Federal Building, Fifteenth and Dodge Streets, Omaha, Nebr.
- VIII. Fort Sam Houston, San Antonio, Tex.
- IX. Fort Douglas, Utah.

These headquarters remain in close contact with the headquarters of the Civilian Defense Regional Areas, which are coterminous with the War Department Corps Areas, and with the representatives of the Corps Area Commanders on duty in the regional offices. The State councils of defense, as the State representatives of the Office of Civilian Defense, will be able to provide the State committees with much information and advice on matters of protection. In further estimating the hazard the State committees may be able to obtain advice from the Army corps area headquarters directly.

### CHAPTER III

## THE SELECTION OF MATERIALS FOR PROTECTION AND THE FORMULATION OF GENERAL PLANS

Once he has taken stock of his position and has formed an estimate of the hazards he must face, the custodian of museum, library, manuscript, and archival collections should survey his holdings to determine what materials will require special protection and what protective measures are best suited to each. In making this determination, the head of an institution will ordinarily benefit from the specialized knowledge of his subordinates, such as division chiefs or experts in subject-matter fields, who are in a position to evaluate the materials under their immediate jurisdiction. These evaluations should result in recommendations as to the nature and priority of protective measures to be applied to materials in each division or field that can be the basis of an institution-wide determination of the relative importance of the various holdings and of the general plans for their protection. Final determination of what materials will receive maximum protection and of how they will be protected is, of course, a responsibility of the head of the institution.

#### Selection of material to be protected

As an initial step, it is desirable to classify the holdings of the institution into such broad categories of value as the following:

1. Material of such importance that its safety must be insured at all costs.
2. Material of relatively great value, the loss of which would be serious but not irreparable.
3. Material the loss of which would not be a major handicap.

Refinements of this classification scheme may well be adopted, with divisions within each category. With certain exceptions, such as paintings or sculpture, it is not usually feasible to classify individual items according to their importance; rather each collection or group of materials should be evaluated as a unit. Time will not ordinarily allow the critical consideration of separate items, nor will it be possible to segregate them for the application of special protective measures. The librarian, for example, will probably have to consider and deal with his local history collection or with the file of a given periodical as a unit rather than as individual volumes.

In general, materials falling in the first category will be limited in quantity and will be those to which it is intended to give the maximum protection possible. Materials in the second category will receive special protection within the limits of available facilities and reasonable expense. The third category will probably include the great bulk of the holdings of the institution and will receive only the protection afforded the building as a whole together with any special guard and fire precaution that may be adopted.

### Criteria for the selection of materials for protection

The classification of materials in the three categories above will be on the two bases of irreplaceability and value, but the specific criteria used will vary widely according to the nature of the material classified. Works of art, historic buildings, manuscripts, and archives are usually by their nature unique and therefore irreplaceable; books and periodicals can more often than not be replaced, though at a cost; museum holdings may range from the unique to the easily replaceable. In determining irreplaceability, the cost and practical difficulty of replacing a book or museum collection in the particular institution should be considered as well as the theoretical possibility of replacement based on the existence of other known copies. Among works of art, etchings, prints, lithographs, and bronzes of which there are several copies, will ordinarily not be considered in the same category of irreplaceability as paintings and other unique objects. The possibility of replacing books will, of course, depend on the existence of other copies, their cost, and perhaps the existence of film copies of the text. The irreplaceability of manuscripts and archives will depend on the existence of film, photostatic, or competently edited printed copies. A historic building may be considered to some extent replaceable if detailed drawings and photographs that make possible its accurate restoration are available.

The possibility of replacing an entire collection must also be considered, as the value of a collection very often depends on its completeness. For example, even though no single volume in a collection on the local history of a given region may be unique, to reassemble a collection of comparable completeness may be a matter of impossibility. The same consideration will apply to collections in museums and galleries.

The criteria of value are even more indefinite than those of irreplaceability. Among the considerations that will affect the relative values assigned different items or collections within the institution's holdings are the following:

1. *Intrinsic or sentimental value inhering in the object itself, rather than in its content.*—Examples are such documents as the Declaration of Independence or the Constitution, which are held priceless in spite of the fact that their texts exist in innumerable printed copies, or historic buildings such as Mount Vernon, for which even the most faithful reproduction would not be an adequate substitute.

2. *Esthetic value.*—This is, of course, a basically important consideration in the evaluation of historic buildings and monuments as well as works of art.

3. *Legal and administrative value.*—This consideration will govern especially the relative determinations of value made by the archivist or the public officer having the custody of official records. The best possible protection should be given records establishing property, citizenship, or personal rights, those establishing the financial obligations and credits of governmental bodies or private institutions, those establishing the legal validity of actions of public bodies, institutions, or individuals, and those essential to the transaction of current business. Records of outstanding loans and similar administrative records of cultural institutions should not be overlooked.



4. *Research value.*—This will be a basic consideration in evaluating library holdings, manuscript collections, archives, and museum collections. The research utility of a given body of material is a matter for determination by experts in the particular field. The present or potential research value of current administrative records and recent periodical and newspaper files should not be overlooked, however, nor should the importance of the scientific and scholarly apparatus essential to research, such as laboratory equipment, general and specialized library catalogs, and bibliographical files.

5. *Monetary value.*—This consideration is often inapplicable to cultural materials and is to some extent determined in the preceding considerations, but it has an important bearing on the practicality of replacing objects that may be damaged or destroyed and thus is definitely to be considered in the relative evaluation of the various holdings of an institution.

#### **Selection of protective measures**

After the custodian of cultural materials has selected from among his holdings those to which he wishes to give special protection and has determined their relative priority in the application of protective measures, the next step is to decide upon the particular means to be used in their protection. This decision will have to be made on the basis of the predetermined value of the material, the degree of danger to which it is exposed, the extent of protection afforded by the building in which it is now housed, the physical characteristics of the material, the nature of its use, and the funds available for protective measures.

The five principal methods of protection are:

1. Protection and reinforcement of the building in which the materials are housed.
2. The application of protective measures to materials in place.
3. The removal of materials to safer storage within the present building.
4. The removal of the materials from zones of danger.
5. The provision of means of restoring or replacing the original materials.

The application of each of these general methods of protection except the last, the techniques of which are relatively well established, is discussed in some detail in subsequent chapters. It is the purpose of the remainder of this chapter only to indicate the types of cultural holdings to which each is applicable.

#### **Protection and reinforcement of the building in which the materials are housed**

The best possible protection of the building in which the materials concerned are housed is a basic measure applicable to all types of cultural resources and should as a matter of course be undertaken by all institutions in areas exposed to enemy attack. Special or increased fire precautions should be instituted, and members of the staff should be trained as auxiliary guards, building air-raid wardens, and fire-control squads. Such special structural reinforcements or other protective measures should be taken as expert architectural and engineering advice may dictate and funds may permit. Specific measures for the protection of buildings, both those housing cultural materials and those that are themselves of historic importance, are discussed in the following chapter.

### Protection in place

Certain measures of protection are practicable for material that remains in use or on exhibit, including rearrangements within the building, fire precautions, and reinforcement of exhibit cases. These are discussed in Chapter V. While measures of protection in place cannot assure the safety of the collections to which they are applied, they have the great advantage of allowing the continued use of the material. Among the materials for which protection in place is advisable are:

1. Records needed in the transaction of current business.
2. Books, records, museum holdings, scientific and scholarly apparatus, and other materials needed for research related to the prosecution of the war or in active use in other serious research.
3. Materials too fragile or too bulky to make practical their removal to storage.
4. Materials that, though valuable and not subject to important current use, are in institutions where the danger of attack is remote and are housed in buildings of superior protective construction.
5. Those materials classed in the third general category of value, the loss of which would not constitute a major handicap.

In general, that is, those materials essential to the provision of effective service by the institution, those whose physical nature does not permit removal, and all other materials not so valuable as to demand extraordinary protective measures should remain in active use with whatever protection can be given in place. Now, more than ever, cultural institutions and public offices need to function at highest efficiency with the maximum possible utilization of their resources.

### Storage in safer portions of the building

Additional protection can be given to materials remaining in the building in which they are housed by placing them in dead storage in portions of the building in which they will be less exposed to danger, such as the basement or interior corridors. No part of the ordinary library, museum, or office building will afford satisfactory protection against a general fire or a direct hit from a demolition bomb, but the dangers of blast, fragments, and small incendiary bombs may be considerably less in certain parts of the building than in exhibit rooms or stacks. This form of protection is especially suitable for:

1. Very fragile objects, such as glass or porcelain, which may be shattered by blasts from bombs exploding close by and which may also be endangered by shipping to safer areas.
2. Materials of great value that, though not in active use for administration or research, need to be at hand for occasional reference.
3. Materials falling in the second general category of value, the loss of which would be very serious but not irreparable.

### Evacuation

Removal to areas not exposed to enemy attack or to special bomb-resisting shelters affords the most nearly complete protection of cultural resources. Materials evacuated may or may not be available for use or exhibit at the place to which they are removed. Evacuation is undesirable to the extent that it removes materials from use or lessens the effectiveness with which they can be used. Packing, moving, and unpacking in themselves expose fragile materials to consid-

erable hazards; and the depository to which they are removed, unless carefully selected, is not likely to afford as satisfactory protection as the original depository against such normal peacetime hazards as vermin, rodents, humidity, excessive heat or cold, fire, and theft. Evacuation of any large body of materials also subjects the institution to very considerable expense. In spite of these difficulties, removal from exposed areas after adequate advance planning may be recommended for irreplaceable materials of the very highest cultural, scientific, or historic value not currently needed for research or administrative use and not too fragile to be packed and shipped with safety.

If the materials are to be removed to a depository in which they can remain in use, a more liberal policy of evacuation will be desirable. The continued availability of the materials removes or diminishes a principal objection to evacuation, and the positive gains resulting from a wider distribution of cultural resources tend to offset other disadvantages of removal.

#### Provision of means of restoring the material

Provision may be made for means of restoring cultural objects that cannot be adequately protected otherwise, such as records, books, and manuscripts that must remain in use, historic buildings and monuments, and archeological and paleontological restorations in museums. Detailed measured drawings of a historic building, accompanied by photographs and adequate descriptive material, may serve for certain research purposes almost as well as the building itself and will make possible its faithful restoration if destroyed. The Historic American Buildings Survey of the National Park Service has prepared such drawings for many structures. Curators of buildings of historic or special architectural importance that are in exposed areas and that have not been recorded by the Historic American Buildings Survey should undertake to have adequate measured drawings and photographs made as promptly as possible. Suggestions to this end are contained in the following chapter.

A more familiar device is the provision of microfilm or other photographic copies of books, records, and manuscripts as a means of preserving the text. Many advantages attach to its use. The preservation of the contents of the material is probably more definitely assured by microfilming than by any other means of protection, and the originals are only very briefly removed from use. The cost is relatively small as compared with that of other protective measures of comparable effectiveness. In addition, there are positive gains to be derived from filming the more valuable manuscripts and records and rarer books, in that through the sale or loan of positive prints of the film the materials can be made more widely available for research use. The principal objection to filming is that it cannot be done quickly and therefore does not offer an immediate solution to the problem of protecting collections against present hazards. The procurement of microphotographic equipment is difficult at the present time, which adds further to the delay. Another difficulty is that the rearrangement of the order of items on a microfilm reel is, for practical purposes, impossible, and the insertion of omitted items is difficult and expensive.

In view of these considerations, if it is possible to obtain the necessary equipment, microfilming as a means of protection is to be recommended for:

1. Rare books and long files of periodicals and newspapers, especially if they are in active use.
2. Public records, especially those required for current use.
3. Well-arranged manuscript collections.
4. Written materials of any kind too bulky to make practical their removal or storage.
5. Material, especially records, now occupying space needed for offices during the war.
6. Written materials that are brittle, charred, water-soaked, or otherwise damaged.
7. Union catalogs, library catalogs, bibliographical files, and similar bulky and costly scholarly apparatus.

Microfilming is not to be recommended for:

1. Documents of sentimental or intrinsic value, for which the object of protective measures is to safeguard the document itself rather than its text.
2. Manuscripts and records of which competently edited printed copies exist.
3. Manuscript collections and record files that are incomplete or not arranged in an orderly manner.
4. Books of which a number of available copies exist.

In summary, microfilming is recommended, if equipment can be procured, for any large, well-organized series of unique or very rare written materials of great value, for which importance attaches to their content rather than to the originals themselves and which are in areas of danger. A splendid opportunity exists for State archives and similar institutions to enrich their holdings permanently and at the same time to make an effective contribution to the protection of cultural resources by filming the basic records of counties and municipalities in areas exposed to enemy attack.

#### Formulation of general plans

The subsequent chapters will include more specific recommendations for putting into effect protective measures of each of the types discussed, but the following observations concerning the general protective program of each agency may be in order:

1. The formulation of detailed plans should be begun immediately if it has not already been undertaken. The proper evaluation of materials, the negotiation for safe storage space that may be needed, the procurement of packing cases and other necessary equipment, the study of the structural capacity of the building to resist bombs and fragments, and other preliminary steps require much time and should not be further delayed.
2. The directors of institutions should work closely with civilian defense authorities in formulating their plans, especially with regard to evacuation and to the establishment of air-raid precautions and fire precautions within the institutions.
3. Plans should be made cooperatively with nearby institutions so that there may be a profitable interchange of information and suggestions and insofar as possible a reduction of costs through the cooper-

ative procurement and use of space, equipment, and materials needed in the application of protective measures.

4. Plans should include extending whatever aid is practical to individuals, to such institutions as churches and old business firms, and to county and municipal governments in the protection of records and other materials of cultural importance in their possession.

5. Plans should be reduced to writing to insure giving to each group of materials among the institution's holdings protection adequate for its requirements and informing each member of the staff of precisely what is expected of him in the execution of such plans.

6. Plans should remain sufficiently flexible to allow for changes in the military situation.

7. Plans should be as simple as possible so that they will be capable of quick and inexpensive execution and should take into account the special difficulties that will attend their execution in periods of actual enemy attack.

8. Plans, once made, should insofar as practical be put into effect immediately without waiting for an actual attack. Measures such as removal of materials may be almost impossible to execute safely and expeditiously if postponed until an immediate and serious emergency arises.

## CHAPTER IV

### THE PROTECTION OF BUILDINGS

A basic problem facing every custodian of cultural materials in areas exposed to enemy attack is the protection of the building in which his holdings are kept. Not only is the building itself usually of very considerable value but its protection is an essential measure for safeguarding the materials that are housed in it. Closely related and even more difficult are the problems of protecting buildings that are themselves of great historic or architectural importance and, being immovable, unlike their contents, must withstand in their present locations whatever hazards the war may bring.

Custodians of these two types of structures should feel a deep concern to inform themselves of the value and limitations of all known protective measures applicable to buildings within potential areas of war and to take promptly every precaution that will reduce the hazards a steadily enlarging circle of conflict may bring to the cultural treasures for which they are responsible.

It cannot safely be assumed that the normal extension of civilian defense measures in every community will automatically protect cultural treasures remaining in place from the hazards of air raids. While every step should be taken to integrate protective work for cultural resources with the broader program of civilian defense, the general problem of the latter is enormous, and in time of stress the preservation of human life will inevitably take precedence over the protection of nonmilitary property. Furthermore, the very nature of the cultural materials involved makes imperative the application of special protective measures not customarily applied to ordinary civilian property. A few of the many special problems which such materials present are: The fragile character of many historic buildings constructed long before the day of concrete and steel; the unusual fire hazards existing in the crowded collections of many libraries and museums; and the customary absence of an adequate 24 hour, 7-day-a-week protective force.

Because open conflict brings many unpredictable problems, advance planning for those situations that are predictable is essential. It is certain there will be no time at the last minute to take precautions the execution of which under the most favorable circumstances takes weeks and even months.

The best plans are simple plans. They are more readily executed in time of stress. They are less likely to create new and unforeseen difficulties as hazardous to the preservation of cultural resources as the dangers of war itself. And their value, as well as their limitations, can be more effectively tested prior to execution.

It is almost as important, moreover, to know the limitations as to know the values of possible protective measures. Plans for sand-

bagging the base of the Lincoln Memorial in Washington, D. C., have been abandoned because of the discovery that rainwater would inevitably filter through the sandbags carrying iron pyrites to the memorial columns and walls and creating an ugly, extensive and irremovable iron stain on the white marble. While such damage would be inevitable if sandbags were used, the damage from bombing remains uncertain; and the limited protective value of sandbagging such a structure does not compensate for certain loss.

In the preparation of plans for the protection of buildings and in the estimation of their advantages and limitations, the custodian will have what assistance can be given by the national and State Committee on Conservation of Cultural Resources, the Office of Civilian Defense, and such engineering and architectural advice as can be obtained through professional groups in his community. All this assistance will normally be needed. But the final responsibility rests upon the custodian himself.

#### Some characteristics of bombs

An understanding of the characteristics and behavior of bombs is essential to the determination of protective measures for structures. Many of these characteristics are described in easily obtainable references;<sup>1</sup> others are described only in publications that are not generally available or are not in a form suitable for reference. The following summary includes only essential material not easily found elsewhere. The two types of bombs with which custodians of cultural resources need be most concerned are high-explosive (including demolition and fragmentation) bombs and incendiary bombs. A brief discussion of each follows.

#### High-explosive bombs

1. The destructive effects of high-explosive bombs are due principally to blast, to flying fragments, and to earth waves resulting from the explosion after deep penetration into ground of heavy delayed-action bombs.

2. The direction of descent as bombs approach the ground is at an angle of 51 to 83 degrees to the horizontal. Because of the sloping flight the bomb may strike a side wall. Even though the impact will be glancing instead of head-on, the bomb may penetrate the side wall.

3. Heavy delayed-action bombs may penetrate into the ground 50 feet or more and through as many as six or more floors of modern construction. Protection from a direct hit is physically impossible in a practical sense.

4. The destructive effect of the explosion varies with the degree to which it is confined.

5. When a bomb explodes there is at first a high positive pressure which lasts at most a matter of some 0.005 second. This is immediately followed by a negative or "suction" pressure of smaller absolute magnitude but of longer duration.

<sup>1</sup> U. S., National Archives, *The Care of Records in a National Emergency*, 9-12, 19-21 (Washington, December 1941. *Bulletins of The National Archives*, No. 3); U. S., Emergency Management Office, State and Local Cooperation Division, *Civilian Defense; Protective Construction*, 1-12 (Washington, 1941. *Structures Series, Bulletin No. 1*).

6. The negative pressure often is more destructive than the positive pressure; windows and walls are often blown outward rather than inward as a result of an explosion outside the building.

7. Because of the extremely brief period of action of these positive and negative forces the inertia of some of the structural elements may produce unpredictable results. An entire window may be wrenched from position without breaking the glass; a freely swinging door may be torn free without swinging open.

8. Fragments from a fragmentation bomb have an initial velocity several times that of the ordinary rifle bullet but because of their light weight and irregular shape they lose this velocity rapidly. Even an unprotected person is reasonably safe 1,200 feet from a 2,000-pound bomb and 200 feet from a 100-pound bomb.

9. The angle at which the lowest fragments fly depends upon the nature of the surface of impact. If an instantaneous bomb hits a concrete pavement it will explode before any significant penetration occurs. In this case the lowest fragments may travel close to the ground. If the same bomb lands in a soft fill it may penetrate to some extent, causing the lowest fragments to take a path 30 degrees or more to the horizontal.

#### **Incendiary bombs**

1. There are two common types of incendiary bombs, thermit and magnesium alloy. Among the less common types are oil, phosphorus, and "fire braves." For various reasons the first two are the only ones of practical significance in the problem of the protection of structures.

2. The magnesium alloy bomb burns with a brilliant white light; the thermit bomb with a yellowish-orange to orange-red light.

3. The magnesium alloy bomb has a thermit igniting charge, which takes about 1 minute to complete its function. This type of bomb requires an outside supply of oxygen and can be smothered. Its temperature of approximately 3,300° F. is sufficient to break water down into its elements, oxygen and hydrogen.

4. The thermit bomb supplies its own oxygen and cannot be extinguished. It burns with a temperature of over 4,000° F. (Copper melts at approximately 2,000° F. and iron at 2,800° F.).

5. The magnesium incendiary bombs most commonly used weigh about 2 pounds. They will penetrate almost all roofs.

6. In order to discourage control an explosive charge is incorporated in some incendiary bombs. The proportion of bombs containing such a charge may be from 1 in 20 to 1 in 50. The explosive charge reduces incendiary efficiency, however, and probably will not be encountered in any large number. The explosive charge, if present, ignites usually not sooner than 1 minute nor later than 2 minutes after impact.

7. Although covered with sand, an incendiary bomb will continue to burn underneath if it is resting on inflammable material, and it will burn through good floor construction of the ordinary type in 2 or 3 minutes.

8. If, when it is burning through a floor, the molten alloy can find an opening it will flow through and drop to the next barrier below. The flowing particles will continue to burn for some time, and as they strike they splash in all directions.



9. If a stream of water is directed against an incendiary bomb, burning fragments will be thrown in all directions with explosive force. A fine spray of water, however, may be applied to advantage. In the form of a spray the water serves two purposes: It causes the bomb to burn out more quickly, and it lowers the surrounding temperature and thus impedes the fire. A bomb ordinarily burns from 10 to 20 minutes. When sprayed the burning may be completed in less than 5 minutes.

10. A pad of sand 3 or 4 inches in thickness under an incendiary bomb will provide sufficient insulation to protect a wooden floor long enough to permit picking up sand and bomb together on a long-handled shovel.

11. Both magnesium and thermit bombs give off great volumes of acrid smoke as they burn.

#### Possibilities of protection

Protection against a direct hit from a high-explosive bomb is ordinarily impossible for the types of buildings under discussion, although fortunately the likelihood of such a hit even during a heavy raid is relatively remote. The present discussion will therefore be confined to protection from incendiary bombs and the resulting fires and from blasts and flying fragments from near misses of high-explosive bombs. A brief discussion is also included of the insurance against the loss of the historic and cultural values of buildings provided by adequate drawings, photographs, and descriptive notes.

#### Fire presuppression and control

1. *Protection against penetration by incendiary bombs.*—The typical incendiary bomb is quite light (2 to 2½ pounds) and is designed to penetrate the usual type of roof but to be stopped by the next obstruction encountered. The intention is to have the bomb come to rest in the attic, which is usually the least accessible space in the above-ground portion of the building and often contains very dry and highly inflammable stored material. If the roof is strongly enough supported to bear the additional weight, a reinforced concrete slab 5 inches in thickness will serve to prevent the penetration of an ordinary incendiary bomb.

Since bombs descend in a sloping flight, they may enter the building through windows or other apertures in the walls. Windows may be bricked over to prevent this occurrence, a procedure not usually desirable, or may be protected by steel shutters if they can be procured or by gravel, stone, or sand revetments. Any protection erected over windows should be sufficiently stout to afford protection against flying fragments as well as incendiary bombs.

2. *Reduction of fire hazards.*—Various characteristics of incendiary bombs have been listed in a preceding section. From the burning temperatures stated it is obvious that highly inflammable materials several feet away may be ignited, and if the bomb happens to be of the explosive variety it may spread its effectiveness over a radius of 20 or 30 feet.

Removal of highly inflammable materials from attics and the floor or floors below to which the burning material may find its way is the first step in the reduction of hazards. As a minimum precaution it would appear highly advisable to remove all accumulations of stored material and to follow this by thorough cleaning of the space.

Under no conditions should it be taken for granted that it is free of movable inflammable materials.

Removal of combustible materials from the floor immediately below the attic is almost as important, if not as much so, as the clearance of the attic. If the attic is unfloored in whole or in part, bomb control at that point will be next to impossible. The only way to prevent a bomb burning through the relatively thin ceiling is to spread sand at least 3 inches in depth beside the bomb, drag it onto this pad by means of a rake or long-handled shovel, and then spray it. The difficulties that would attend such a procedure with the bomb resting in the narrow space between the open joists can be imagined. Bomb control in the attic should be attempted, nevertheless, but, in case of failure, preparations should be made on the floor below to deal with the bomb.

Furniture, paper, and highly inflammable fluids, particularly specimens preserved in alcohol, should be given special attention. If inflammable fluids cannot be removed to a safe place they should, if possible, be transferred to non-breakable containers, though the possibility of explosion of fluids in such containers if subjected to intense heat should be considered. If glass jars of alcohol or similar fluids must be kept in rooms that may be subjected to incendiary bombs, they should be placed on wide shelves from which they will be jarred only by a major disturbance. A batten across the face of the shelf will provide an additional safeguard against the jars falling to the floor and breaking. Such fluids, as well as easily fired stacks of papers and magazines, draperies, and similar materials, should be moved up at least 2 feet above the floor or be removed altogether. Not only should they be removed thus from possible proximity to a bomb to protect them from fire but, what may be more important, they should not be in a position where bomb control may be hampered by concern for their damage by water.

The element of time is of major importance in the control of incendiary bombs. If control is 3 minutes away, so far as preventing the start of a fire is concerned it might as well be 3 miles away. Control must be undertaken immediately, even without regard for the possibility of the incendiary bomb's being explosive, and the procedure must be swift and accurate. Accessibility is, therefore, an extremely important consideration. Narrow and tortuous passageways between cases, stacks, and files not only increase the time lost in undertaking the control measures but may also impede the use of long-handled tools essential in dealing with the bombs. Files, stacks, and cases in rooms that may receive incendiary bombs should be limited to the number that can be arranged so as to provide free and quick access to all points in the room. Narrow spaces in which a bomb might be secure from disturbance and dead spaces must be eliminated. It must not be overlooked, moreover, that the dense smoke that accompanies the burning adds to the importance of clean, wide, straight passageways.

It is extremely doubtful that spreading sand over an attic floor will serve to prevent the ignition of the floor. Few structures have sufficient unused load capacity to carry the weight of a layer of sand deep enough to be effective. As has been stated, at least 3 inches under a bomb is necessary to protect wood construction and even

with this depth the bomb should be sprayed or removed. Even a very light bomb which has been retarded by the resistance of the roof will penetrate several inches of loose sand, and a minimum of 7 or more inches will be required to insure that at least 3 inches of sand remains under the bomb when it comes to rest. Covering the sand with wire mesh would probably improve the device but not sufficiently to reduce the depth of sand necessary unless the wire were quite stiff or were strongly held in position at short intervals. Sand, ashes, or foamed slag may retard the progress of fire, however.

Flooring with 12-gage corrugated iron sheets laid loose should prove highly effective in unfloored attics if the structure can take this additional load.

3. *Control plan.*—The protection problem of a building located in a community having readily available an adequate fire-fighting organization together with an efficiently organized civilian defense establishment is obviously much simpler than that of a building located in a sparsely settled area with limited or no municipal facilities. It is true that a building so isolated is less likely to be a target, but its immunity from bombing attack can by no means be assured.

Another factor which must be taken into consideration is the limited personnel on duty at night in buildings such as those under consideration. Even during the day the personnel may not be adequate to provide a watcher for each 8,000 square feet of critical space, the minimum found necessary in London.

Civilian defense is now organized in all critical seaboard areas, and the services of the civilian defense agencies should be used. A control plan to provide adequate protection should be prepared and coordinated with the local defense agency. In all probability the personnel regularly associated with the structure will have to be augmented by civilian defense volunteers.

The peculiarities that will attend air raids must not be lost sight of. Fire departments are manned and equipped under the assumption that a single fire will occur at a time in the area served by any one station, an assumption justified by normal experience. Right-of-way for apparatus and high speed of travel are also taken for granted. Under actual raid conditions fire-fighting organizations may be overwhelmed with calls for help and greatly hindered by the traffic difficulties that attend a blackout. It will no doubt be impossible, moreover, for personnel not at the building to return there, especially those who require transportation.

It is not unlikely that considerable time may elapse before fire apparatus can arrive, particularly if telephonic communications are disrupted and the alarm must be transmitted by messenger. Likewise it is possible that the water supply may be disrupted or the water pressure greatly reduced by the aggravated demand.

All these possibilities must be faced realistically and a control plan mapped out to meet all possible exigencies.

4. *Training of personnel.*—The most valuable prevention and control measure that can be taken is the development of an adequate and thoroughly trained protective organization.

The members of this group should be organized and trained in the same manner as air-raid wardens and auxiliary firemen in the

Citizens' Defense Corps. When this training is completed they should be given the additional training necessary to meet the peculiar conditions of the structures to which they are assigned. If the structure is small they should become thoroughly familiar with the entire building and its contents, passageways, and utilities. If the structure is a large one it should be assigned by sections.

Too much time cannot be spent in insuring that each individual can quickly get to any point in the area to which he is assigned even under the most adverse conditions.

5. *Equipment.*—It is believed unnecessary here to discuss common fire equipment as the local fire department can no doubt be most helpful in this phase of the problem. The present discussion will be limited to the equipment peculiar to bomb control.

The two most effective measures, spraying and insulating with sand, have already been discussed. The sand should be reasonably dry and readily available. Loose sand in pails is best for the bottom pad although sand bags may be used. If sand is bagged, the small-sized bags used in the construction industry should be filled to not more than one-fourth or one-third of their capacity. This amount of sand will weigh about 30 pounds; heavier bags are difficult to handle with ease and accuracy. Filling the bag only partially, however, may result in a poor distribution of the sand when the bag is thrown into place; hence a pail is recommended instead.

In using water, either the fine spray from an ordinary garden hose or from one of the hand-operated pumps is satisfactory, but complete dependence should not be placed on a hose using the regular water supply. The water may be cut off.

The so-called stirrup pump used extensively in England is probably the most satisfactory. This pump draws its supply from a pail and is operated by two persons, one spraying and the other pumping. Ordinarily this pump has at least 30 feet of hose so that the pumper can work in an adjoining room. This is a decided advantage since the exertion of pumping is extremely taxing if performed in the acrid smoke given off by the bomb. By changing the intake from pail to pail it can discharge indefinitely.

The back-pack pump common to forest fire fighting is also suitable, though less so than the stirrup pump, since once the back-pack pump is empty it must be taken out to be filled.

Ordinary chemical fire extinguishers should not be used for bomb control. Soda-acid extinguishers are nothing more than water under chemically generated pressure. The foam type of extinguisher does not appear to excel the simple water spray, and both it and the soda-acid type are more likely than the water spray to discharge a stream instead of a spray. The presence of free acids in the soda-acid extinguisher may seriously damage library and museum holdings. The carbon tetrachloride extinguisher should not be used on a bomb under any circumstances. The tremendous heat of the bomb on this chemical would cause the formation of phosgene, a lethal gas.

Asbestos flakes, talc, and similar powders can be used for smothering in place of sand, and in some relatively infrequent situations they may be more suitable than sand. For example, sand may do major damage to an intricate piece of machinery. A graphite powder is used instead to avoid this difficulty. Hard pitch is also recommended

as a smothering agent; but it is difficult to remove and should not be used in rooms where it may spatter on books or exhibits.

In addition to the sand and pumps, long-handled, square-pointed shovels and protective covering for the face and hands are essential. After a burning bomb is raked onto a pad of sand it can be lifted by inserting the shovel under the pad, dumped into a pail of sand, covered with more sand, and removed.

The equipment for control of the bomb is quite simple. It can be highly effective, nevertheless, in the hands of well trained and instantly available persons. If a bomb lands, the man, tools, and materials must go into action at once. Time lost running to a closet for materials concealed for esthetic reasons or to avoid developing a fear complex may disable the entire effort. These preparations must be regarded in the same light as the front-line preparations to repel an assault. Pails of sand are evidence of the ability and intention to fight whenever the enemy chooses to strike.

### Structural protection

Structural protection necessary for any particular building depends upon several factors, among which are the proximity of probable bombing objectives, the nature of the surroundings, the character of the structure, and the type of construction. No general rule will suffice; each building must be studied individually with the aid of the best architectural and engineering advice, and the protective measures most practical for its particular requirements must be devised.

A structure completely surrounded by other buildings or by woods or located on a promontory gains some protection from its surroundings. A building in a densely built up area, for example, may be exposed only at its front and to a much less degree at its rear. Even in the front it is protected more or less from damage by flying fragments by the buildings on the opposite side of the street. A structure in the open, on the other hand, is completely exposed on all sides and is subject to damage from all fragmentation or demolition bombs which may land within the maximum distance that fragments are effective.

Protection of structures from the effects of a direct hit by a high-explosive bomb is a practical impossibility. The impact force of even a dud 500-pound demolition bomb is of astounding magnitude. When this force is increased 30 or 35 times by detonation the figures become of astronomical proportions. Equipped with delayed-action fuses, these bombs are capable of penetrating certainly as much as six stories of modern construction before detonation, and possibly even more. Since the structures under consideration rarely exceed four stories and often are less than this, the virtual impossibility of protecting them from direct hits of demolition bombs is evident.

Structural protection, then, must be directed at preventing if possible, or at least minimizing, the effects of bombs landing near but not on the structure.

1. *Structural survey.*—The first requirement is a detailed survey by a competent structural engineer who has thoroughly familiarized himself with the peculiarities of the problem at hand.

Little benefit would be derived from an abbreviated discussion of the structural considerations here, since it would be inadequate for

the engineer and of even less use to others. The essential information, moreover, will be available in such publications as *Civilian Defense; Protective Construction, Structures Series, Bulletin No. 1*, issued by the Office for Emergency Management (Superintendent of Documents, Washington, D. C., 25 cents), and others issued from time to time by the War Department and the Office of Civilian Defense.

The consideration that should be emphasized here is that the resistance of a structure to the effects of a nearby detonation must not be taken for granted. There is, of course, considerable latitude of decision regarding the probability of bombing in any case and regarding the degree of protection that is practicable, but there is no latitude regarding the necessity of having complete and accurate structural information. Decisions arrived at and plans made without reference to a survey made by a thoroughly competent structural engineer can be nothing better than a gamble. Institutions and organizations unable to engage the services of a consulting engineer can often obtain helpful advice from the nearest chapter of the American Society of Civil Engineers.

2. *Fragments and flying glass.*—Damage due to fragmentation may be serious if the hit is close by. The bomb fragments are projected at a velocity four or five times that of an ordinary rifle bullet, though because of their irregular shape they lose velocity rapidly; they may be fairly large in size; and close to the explosion they may be considerable in number. It has been found in England that a 13½-inch brick wall, 12-inch reinforced concrete wall, 30-inch sandbag wall or 24 inches of gravel between forms provides adequate protection from fragmentation from a 500-pound bomb at 50 feet and important protection even at 25 feet. If sandbags are used they should be protected from the weather, placed on a platform several inches from the ground, and removed several inches from the building. Some protection of this sort is of special importance for doors and windows.

Fragmentation bombs are fused to detonate on contact before the bomb enters the ground. Whether this happens or not depends largely on the rigidity of the surface of impact. Maximum efficiency occurs where the bomb lands on hard pavement, minimum when it lands in soft earth.

When the bomb detonates before entering the ground the fragments are projected in all directions, including the horizontal. Maximum damage from this source might occur, then, where the structure is adjacent to a paved street. The greatest destruction would be in the horizontal plane in which detonation occurred because at this point the building wall is least distant from the point of explosion. Higher up, the increased distance from the structure to the bomb has a marked effect on the velocity of the fragments. For example, consider the entrance to a structure the first floor of which is 4 feet and the second floor 15 feet above the pavement surface. From a point 25 feet away the shortest distances to the first and second floors are 25.3 feet and 29.2 feet, respectively, an increase in distance of more than 15 percent for even these small dimensions. Since the effectiveness of fragments decreases rapidly with the increase in height of the structure, the height to which fragmentation protection is essential is limited even in the most unfavorable circumstances.

If the ground surrounding the structure is relatively soft so that some penetration of the bomb occurs before detonation the surrounding soil blankets the dispersion to some extent. In very soft ground this may result in the lowest fragments being those in a plane at an angle of about 30 degrees to the horizontal. In such a case there would be no fragmentation damage below this plane and because of the longer path of travel for the fragments above the plane, their effectiveness would be greatly reduced.

The surroundings of the structures under consideration consequently have a most important bearing on the determination of whether fragmentation protection is necessary. For structures located in extensive lawn areas the principal problem would be the faces adjacent to driveways or parking areas. A well compacted gravel surface on a subgrade sufficiently firm for roadway use should be considered a hard surface area; a lawn area sufficiently compact to show no appreciable depression if an ordinary passenger car is driven over it should be considered moderately hard; an uncompacted new fill at least 3 feet deep might be considered soft.

Damage due to fragmentation, unless the bomb lands very close by will probably be in the form of ragged scars but not of an extremely destructive nature. The various historical structures under the supervision of the National Park Service have not yet been studied in detail, but preliminary consideration indicates that very few indeed will require structural protection against fragmentation, and where it is necessary it probably will be very limited in extent.

Blasts from bombs bursting nearby may hurl inward glass from broken windows and even an entire window-casing, glass, and all. Exhibit cases and stacks in the line of window or door openings are particularly vulnerable and should if possible be removed to safer locations. Windows may be bricked over or covered on the inside by steel or heavy wood shutters as a measure of protection against flying glass. If the window is covered completely with heavy adhesive paper, cloth, or fishnet, breakage will not be prevented but the number of fragments of glass will be reduced.

3. *Collapse from debris loads.*—Structural collapse of the upper portions of a building results in a heavy load of debris being deposited on the lower floors. The dead load may thus be increased 200 to 400 pounds per square foot or more, and floors usually are not designed to support so great an addition to their normal load.

If, as a result of the structural survey, it is found that there is an inadequate surplus load capacity, decreasing the load by removing part of it or locating concentrated loads near the ends of beams rather than near their center may be the best remedy. Particular attention should be given to heavy, concentrated loads that may fall, such as safes, machinery, or heavy cases. Any such object, falling from a higher floor, might cause far more damage than the more evenly distributed load that would come from the collapse of part of the structure.

Secondary damage to collections because of damage to utilities is a possibility that should not be overlooked. Damage to utilities, particularly water mains and steam pipes, caused by a direct hit outside the building or by the collapse of part of the building may

result in damage to collections within the building. Broken gas mains and electric lines may constitute a serious fire hazard.

#### Creation of accurate records of historic buildings

The protection of all buildings is impossible, but it is within our power to make a record which will mitigate the loss by preserving the design for posterity. A set of measured drawings, careful sketches, or well-taken photographs can record even the atmosphere of the building for future generations. Such records are also invaluable if repair, restoration, or reconstruction is attempted. The ideal record would be a complete survey of each structure, consisting of measured drawings, photographs, and data sheets similar to the documents of the Historic American Buildings Survey. The first need is a list of the buildings that are worthy of record. The second is the collection of information concerning existing records, whether in public or private hands. The third, which though last in order is the most pressing, is the immediate preparation of the records of such buildings as have not been adequately photographed or recorded by drawings.

1. *The list of buildings.*—In regard to the listing of buildings an important accomplishment has been made by the Historic American Buildings Survey, National Park Service, Department of the Interior. The whole country has been divided into 71 districts, in each of which a local architect serves as district officer. Each of these architects has compiled a list of all historic structures in his district and established a priority for their recording based upon their importance architecturally and historically. This list can serve as a basis for determining the recording of historic structures. Each district officer also has a list of all the structures in his area recorded by the Survey and is able thus to prevent waste of valuable time through duplication of work already performed. He can contribute to the organization of the work by suggesting methods to be followed to maintain the standards of recording established by the Survey.

2. *Existing records.*—It is possible that the number of important buildings of which no records exist is not great. Nevertheless few have been so thoroughly illustrated as to require no further attention in this regard. To trace existing records and to obtain useful and definite particulars of each item are difficult tasks. Apart from general views and snapshots, neither of which class has sufficient precision to be useful, there are doubtless many excellent records of buildings, the work of competent photographers. Some of these have been preserved in local historical societies, architectural clubs, museums, and libraries. Published materials—monographs, architectural and building periodicals, and books—contain other records.

There is but meager information concerning drawings that may be in existence, but a canvass of architects may reveal in their files plans made in the course of their business practice.

3. *New records.*—The large number of records included in the Historic American Buildings Survey justifies using it as the basis for all similar work in the future. For uniformity the new records insofar as possible should conform to the standards established by the Survey. The National Park Service, through the Historic American Buildings Survey, will gladly furnish instructions for preparing the survey and,



to the extent the materials on hand will permit, can supply field books and drafting paper and related supplies.

Since accurate architectural plans and measured drawings are the most definite of all records, architects and draftsmen can be of great assistance.

Photographers, through their ability to make extensive records in a relatively short time, can contribute materially to a survey of this kind. A complete photographic record of a structure will include exterior elevations and interior views and detailed views of features of special interest.

Data sheets pertaining to the age and history of the structure, name of architect, owner, and builder are desirable supplements to the drawings and photographs.

## CHAPTER V

### THE PROTECTION OF COLLECTIONS IN PLACE

In addition to the precautions taken for the protection of the building, certain other measures may be initiated for further safeguarding the collections housed therein. These consist, in general, of:

1. Removing the more valuable and more easily destroyed materials to safer parts of the building.
2. Providing better protection from splinters, fragments, and concussion for the materials remaining on exhibit or in use in the rooms in which they are now located.
3. Taking special fire precautions for the protection of the materials themselves.

#### **Removing collections to safer parts of the building**

When a survey of the building is made to determine what measures are possible for the general protection of the structure itself, advice should be sought as to which areas of the building will be most nearly safe from bombing attack. No parts of such buildings as those in which cultural resources are usually housed will afford satisfactory protection in the event of a direct hit by a heavy demolition bomb. In general, the basement and interior rooms and corridors afford the best protection against bomb fragments, blast, glass and other splinters, and other effects of near misses. Basement space is, however, unsuitable for refuge if there are exposed steam and water pipes whose bursting would damage the materials stored. Valuable materials should be removed from the attic and top floor of the building and from the vicinity of unprotected windows and skylights. The curator of cultural materials should not attempt to apply to his own building general conclusions concerning shelter space without the benefit of architectural or engineering advice, as the wide individual differences in the location, structure, and materials of buildings make each a distinct problem.

Expert advice should also be obtained on the possibility of further strengthening the part of the building selected as a refuge. One danger that attends especially the use of basement space as a refuge is the collapse of the floor immediately above due to the weight of debris that may have fallen from higher stories. Often simple and relatively inexpensive structural precautions can be taken to reduce this danger. Rerouting of steam and hot-water pipes, bricking over of windows, and making special provision for ventilation may also be desirable for the refuge space.

Materials removed to refuge space had best remain in active or at least semiactive use. If the conditions of storage or the limitations of space in the refuge are such as to make this impossible, it is probably advisable to pursue the alternative course of lending the material to some responsible institution outside the zone of danger, where it will be even safer and at the same time remain in active use. Another possibility, if the material to be placed in the refuge is small in quantity

and easily handled, is to prepare the storage space and the plans for removal to the smallest detail, but to leave the material in use until danger is imminent. It is conceivable that there will be rare cases where materials may safely await removal until the sounding of an air-raid alarm. For most types of material, which must be handled slowly and carefully, removal would have to begin days or weeks rather than minutes before the anticipated danger.

If it is necessary, however, to pack the material and place it in dead storage within the building, the suggestions on packing in the following chapter will be applicable. If basement storage space is used, extraordinary care to assure the proper humidity is advisable.

The selection of materials to be moved to safer space in the building should not be based on value and irreplaceability alone, but on the nature of the material. Specimens preserved in alcohol and other highly inflammable collections, for example, should be placed in areas where they will be best protected from incendiary bombs or fire and where any fire starting among them would be least likely to spread to other portions of the building. It is advisable also to place specimens preserved in alcohol in nonbreakable containers to lessen the possibility of having the alcohol spilled on floors, walls, and other collections, where it may cause damage itself and will enormously increase the fire hazard. Glass, china, and other highly fragile objects should be packed for protection against breakage and moved to those parts of the building where they will be most nearly safe from fragments, splinters, and concussion.

Asbestos sheets may be used to protect geological and archeological specimens, which may be calcined by the heat from incendiary bombs. Sculpture and architectural fragments may be dismounted, packed with asbestos wool, and surrounded by sandbags or other protective barriers. Paintings may be placed in bags of linen or silk oilskin or cellophane and sealed with "airplane dope." For greater permanence, cellulose acetate foil or cellulose acetate butyrate foil is to be preferred to cellophane. After having been covered with protective fabrics, such pictures may be protected with mattresses or other padding, and covered with a wire mesh anchored to the wall, or with steel and asbestos composition or asbestos boards. Sandbag protection may have some value, but the bags should be several inches at least from the pictures, and their tendency to collect moisture should be carefully watched.

Books placed in dead storage in basement or other refuge space within the building should be packed firmly in boxes and raised several inches from the floor on timber balks. They may be protected from falling debris by corrugated iron coverings.

#### **Protection of materials in use**

The extent of protection that can be given to materials remaining in use in the exhibit rooms, stacks, or offices in which they are at present housed is necessarily limited. Since it is to be expected, however, that the vast bulk of the holdings even of agencies and institutions located in zones of considerable danger will remain in this category, it is well to consider the possibilities which do exist. These materials will benefit, of course, from all measures for the general protection of the building, but certain additional precautions can be taken.

These additional precautions will be designed largely for protection against splinters and fragments and concussion. The danger from flying glass from windows broken by blast, an important factor to deal with, may be somewhat lessened by covering the windows completely with heavy adhesive paper or by placing heavy wire screen inside the windows. Strips of paper will serve no useful purpose. Substantial inside wooden shutters that can be closed or placed over the windows after an air-raid alarm has sounded will serve better. Heavy wire netting below skylights will also tend to stop flying glass. None of these devices will be effective against bomb fragments or incendiary bombs in sloping flight, for which heavier reinforcements, as discussed in the preceding chapter, will be required.

In addition to window and skylight glass, the glass in exhibit cases and glass-enclosed bookcases offers danger from splintering due to concussion. The glass may be removed entirely if the materials will not suffer thereby. Protection must be provided, however, against the excessive brick and plaster dust that will be in the air after an air attack. The hazard may also be reduced somewhat by covering the glass in exhibit cases completely with strong adhesive paper, cloth, or transparent plastic.

Protection may also be given, to some extent, against objects falling as a result of concussion. Fragile objects hung from walls should be removed, and others reinforced in their hangings so that they cannot easily be jarred loose. While materials in top stories where incendiary bombs may need to be combatted should be kept away from the floor, heavy objects can be put on bottom shelves where their fall will not damage objects below; in parts of the building to which incendiary bombs are unlikely to penetrate heavy objects may be placed on the floor. Material that must remain on shelves can be held in place by wire netting or cloth to prevent its falling. If books remaining in use are packed tightly on shelves, they will be protected to some extent from jars and concussion.

Objects that remain in use in regular exhibit rooms, stacks, or offices will not ordinarily be of the very highest value, and it is not generally desirable that measures taken for their protection should be of such a nature as to impede unduly their use or enjoyment.

#### **Special fire precautions**

Fire presuppression and control are discussed in the preceding chapter on the protection of buildings. Certain special precautions, however, may be possible for the protection of the collections themselves from fire. Care should be taken to determine that the materials used in fire extinguishers are not of a nature to cause irreparable damage to the objects in rooms where they will be used. Carbon dioxide extinguishers should be used if possible; if not, arrangements should be made to have staff members available to recover, dry out, and salvage materials the instant any fire is extinguished.

If practical, specimens preserved in alcohol and other highly inflammable objects that remain on exhibit or in use should be segregated from other parts of the collections. Tarpaulins or other protective covering may be provided to be placed over stacks, cabinets, and exhibit cases when they are not in use. They may provide partial protection from water used in putting out a fire occurring when the building is closed to the public.

## CHAPTER VI

### EVACUATION

The principal advantages and disadvantages of evacuation as a means of protecting cultural resources and the criteria of selection of materials for removal are discussed in chapter III. The custodian of cultural materials who has decided that the removal of a part of his holdings is or may become advisable and has selected those collections that he wishes to remove will still be faced with the selection of a depository and the problems of packing, transportation, and storage.

#### Planning the removal

The packing and removal of delicate cultural materials requires a great deal of thought and advance planning even under the best of circumstances. Plans for evacuation cannot be improvised on the spur of the moment, and an inadequately planned evacuation can be more dangerous than enemy attack. It cannot be emphasized too strongly that if the removal of any part of its collections is contemplated by an institution, even as a possible future measure to be adopted if the military situation becomes more grave, complete plans and preparations should be made without delay. These plans and preparations should include:

1. Any necessary legal clearances.
2. The segregation, labelling or other identification, and listing of the materials that have been selected for removal.
3. The selection of and conclusion of definite arrangements for a depository, including any necessary physical alterations in the depository if it is purchased or leased by the institution.
4. The determination of the method of packing to be used and the selection and procurement of containers and other packing material.
5. The necessary arrangements for transportation.
6. Provisions for inspecting and guarding the material in its temporary depository.

#### Legal clearances

Heads of institutions will wish to obtain from their governing boards approval of any plans for evacuation and a clear statement of their authority to act. Public officials will need to effect well in advance all required clearances with higher authorities. Especially is it essential that a definite written understanding be reached with the owners of all material on loan or deposit in the institution defining the authority of the institution to remove the material or take other measures for its protection and releasing the institution from liability for its damage or destruction.

#### Segregation and identification of material to be removed

The material that has been selected for removal should be carefully listed in detail. When the lists have been completed, the

destination of each collection, brief instructions for its packing, and similar notes can be inserted. From these lists shipping lists such as those subsequently described can be prepared quickly. The lists are also an important precaution against overlooking items and small collections in any hurried removal.

If they can be removed from use conveniently, it will be economical as they are selected to segregate in a separate room or rooms all collections that will be evacuated. The rooms in which they are placed should afford the best possible protection while the material remains in the building and should have adequate space and facilities for packing. If it is desired to keep the material in use up to the moment of its removal, all collections and items selected for evacuation should be identified by stickers, tabs, or similar devices so that employees of the institution can transfer them without delay to the packing room when the time for removal has come.

#### **Selection of a depository**

Perhaps the most important single step in the process of evacuation is the selection of a suitable depository to which the materials can be removed. In making this selection, the custodian of cultural materials should be guided by the following criteria:

1. The depository should provide as nearly as possible complete protection against enemy air attack and other hazards of war.

2. It should provide thorough protection against excessive humidity, variable temperature, insects, rodents, fire, theft, and other normal hazards.

3. It should, if possible, be of such a nature as to permit the continued use of the material deposited.

4. The use of the depository should not entail heavy expense.

British experience, helpful as it is in meeting other phases of the problem of protection, is only with many qualifications to be recommended as a guide in the selection of a depository. Since the entire area of Great Britain has been within the range of enemy air attack, in order to meet the first criterion of safety from bombing it was necessary there to resort to the use of abandoned mines, isolated country houses, and specially constructed underground shelters. Depositories of none of these types are entirely satisfactory from the point of view of the other three criteria, and their use in the continental United States is not ordinarily to be recommended.

Caves and abandoned mines probably afford the most nearly bombproof shelter available, and their use may become advisable if it is necessary to provide safe storage for large quantities of material in areas that are exposed to enemy air attack. The cost of preparing a cave or mine for use as storage space, though probably not nearly as great as that of excavating and constructing an underground shelter with equivalent resistance to bombing, would be quite large. More important objections are the general inaccessibility of caves, the impossibility of making effective use of the materials stored in them, and the excessive humidity usually but not always encountered. Through the courtesy of the National Speleological Society, the Committee on Conservation of Cultural Resources is in a position to provide specific information concerning caves in a number of areas.

A specially constructed shelter, to be really bombproof, requires a roof and walls of many feet of reinforced concrete. Much time would

be required for the concrete to dry adequately. In addition to the great expense, materials for the construction of such a shelter are difficult if not impossible to procure at the present time.

Isolated houses in rural districts and villages are much less likely to be hit by bombs than are buildings in large coastal cities and are less exposed to the danger of fire spreading from adjoining buildings. Some institutions, especially museums, have leased or purchased country houses as temporary shelters and have placed members of their staffs in residence in the houses to guard and care for the materials deposited. The houses that have been selected are in most cases near the cities from which the materials have been removed.

Though the use of country houses as depositories has the important advantage of allowing close supervision of the evacuated collections by the staffs of the institutions from which they are removed and provides a large measure of protection, it entails certain disadvantages. The expense of procuring and remodeling such a building and maintaining a separate staff in the temporary depository is beyond the resources of all but a few institutions. The buildings themselves, not having been especially designed to house cultural resources, seldom afford maximum protection against fire, rodents, and insects or optimum atmospheric conditions. If the buildings selected as depositories are in the range of enemy attack, even though remote from specific military objectives, they are not completely safe from bombing. Their isolation from centers of population, though it lessens the danger of attack, decreases the fire and police protection that can be given. Finally, the use of materials deposited in rural houses is severely restricted if not made impossible.

Abandoned factories and warehouses will almost never make suitable depositories. Bank vaults afford excellent protection against theft and good protection against fire, but the measure of protection against high explosive bombs will depend on the location and structure of the bank building. The cost of this type of storage space makes its use for large quantities of material impractical.

For most institutions the most satisfactory depository will be a competently administered institution of the same nature located beyond the present or probable future range of enemy air attack. Thus several libraries have deposited the more precious parts of their holdings in other libraries away from the coast; some art galleries have made loans of their more valuable paintings to art centers in the interior of the country. Colleges and universities may be competent to care for varied types of material. The same principle may apply to officials having the custody of public records and to business firms having valuable record material. County officials, for example, may wish to deposit their more valuable records not needed for current use in the State archives, if there is such an agency, or in county courthouses remote from the coast and from military objectives. Large business establishments with headquarters in coastal cities may find it advisable to transfer their more valuable records to branch offices in the interior.

An important advantage of such an arrangement is that the museums, galleries, libraries, and archival agencies with which the collections are deposited already have for the most part buildings specially designed to house such materials and to provide adequate

protection against the normal hazards of peace. They also usually have a trained staff to care for the materials. The expenses of buying or leasing a depository, of fitting it to receive the collections to be transferred, and of staffing it are thus avoided or greatly reduced, and the time that would be consumed in effecting such arrangements is saved.

More important still, in inland museums, galleries, libraries, and archival agencies the treasures removed from zones of danger can be put to use, and the cultural resources of the nation, instead of being depleted by war, can serve to enrich during the period of danger the life of those areas remote from the larger centers of population.

The depository selected should be at some distance from the coast, preferably well outside the hundred-mile zone now considered endangered. It should be in a relatively small place that does not have important factories or military posts and is not on a main transportation artery. It will be necessary to study carefully the resources of the proposed depository for the protection of the materials stored there against the normal hazards of peace. The building should be fireproof, should be free from insects and rodents, and should provide the atmospheric and other conditions proper for the particular type of materials to be deposited. Adequate precautions against fire and theft should be maintained. The institution should have a professional staff competent to care for the materials. The institution placing the materials on deposit may wish to supply funds to make minor structural alterations, provide additional shelving, increase the size of the staff, or otherwise enable the institution receiving the materials to meet more adequately its added responsibilities.

The Committee on Conservation of Cultural Resources has initiated a survey that is being made by the Historical Records Survey of the Work Projects Administration to assist institutions in danger zones to locate suitable temporary depositories for the materials that they may wish to remove. The survey in each State is made under the supervision of the State committee on conservation of cultural resources. It is designed to cover only institutions already having the custody of cultural materials, such as libraries, museums, and archival agencies, although other possible depositories may be included at the request of the State committee. Information collected in the course of the survey will be quite detailed and will cover all the factors to be considered in the selection of a depository that have been discussed in the preceding paragraphs. Provision is also made in the survey for reporting to the State committee the needs of institutions in danger areas that are seeking space for the temporary deposit of their holdings.

Through the medium of the survey, committees for those States that include areas of danger will undertake to assist institutions planning to remove part of their holdings in finding suitable depositories. If there is not enough suitable space available within the State, the National Committee, on the basis of the reports from other States, will endeavor upon request to call to the attention of the State committees or of individual institutions possible depositories located elsewhere.



### Packing, transportation, and storage

The procurement of suitable containers and the packing, transportation, and storage of cultural materials present a number of problems. It is impossible within the scope of the present handbook to prescribe methods for dealing with every type of cultural material, though certain general observations will be presented. Further information on their specific subjects can be obtained from two publications of the Freight Container Bureau of the Association of American Railroads: *The A B C of Good Crating* (New York, 1927, 16 p.), and *A Guide to Good Construction of Nailed Wooden Boxes*, (New York, 1930, 23 p.). Specific advice on individual questions can often be supplied by the staffs of the larger institutions. The Committee on Conservation of Cultural Resources will undertake to obtain answers from technical experts in the Federal service on specific questions addressed to it.

Any plan of evacuation should provide for the preparation as early as possible of the materials involved, for the assignment to specified personnel of the responsibility for supervising the transfer, and for transportation facilities. The various types of library, museum, and archival material each present distinct problems of storage and transportation, but certain general considerations apply to all collections.

Rapid removal, it must be repeated, will be of first importance once evacuation is undertaken; delays will be avoided if plans are drawn immediately to cover such practical details as the containers needed and the use of elevators, stairs, loading platforms, and trucks. Each custodian of cultural materials will naturally consider the demands that may be made upon his staff by the military or civilian authorities.

A first step in planning the actual physical transfer is the establishment of the sequence in which the material is to be moved. Ordinarily priority should be given to the most valuable items, but practical considerations such as the plan of arrangement in storage may affect the decision. Once the sequence of removal has been determined, the order of each item or collection can be indicated on the lists of material to be removed that will already have been prepared.

The evacuation of any large quantity of material will undoubtedly require the use of special containers. The size and type of container procured will depend of course primarily on the material to be removed, but such factors as the money available and the means of transportation influence the choice. Containers that will be used to hold the material after it is placed in storage may need to be different from those that will be used only in shipping. Regardless of the type of container decided upon, the following suggestions should be borne in mind: (1) A few standard sizes will be less expensive and more convenient than numerous special sizes. (2) Containers ordinarily should be small enough to be handled by one man when packed. (3) For convenience in storing and transporting, containers having protruding handles, locks, or hinges should not be used.

The means of transportation used to effect evacuation will depend upon the volume of material to be moved, the distance to be covered, and comparative costs. Large collections to be shipped long distances may perhaps be handled most conveniently by railroad; ordinarily, however, motor transport will be used. Since the method of transportation should be taken into consideration in selecting the type of

container to be used and the manner of packing, the choice must be made at an early date. Provisional arrangements with the transportation concern selected should cover such items as insurance and labor to be supplied. If trucks are to be used, their weatherproofing, the number of shipments and their spacing, the routes to be followed, special equipment necessary (dollies, skids, stevedores), and similar problems should be analyzed.

Whatever means of transportation is chosen, it should be made certain that the facilities will be available on short notice and in spite of the abnormal conditions that will arise during an emergency. To avoid trouble, it may be reiterated, as much of the evacuation process as possible should be accomplished before an immediate emergency arises.

An essential function of the personnel assigned to handle the evacuation will be the supervision of the loading and unloading of the containers. One staff member at least should supervise the placing of the containers on the trucks and another should see to their deposit in emergency storage. Unless the trucks are locked, it will be wise to provide for additional members to accompany the shipments. Shipment receipts should be made out for each truck load and checked carefully when the trucks are unloaded. In addition, a detailed list of the materials in each container should be made in three or more copies. One copy should be held by the institution, one mailed to the depository, and one packed in the container.

If the evacuated collections are not placed in an institution already caring for similar materials, complications will be avoided if attention is given beforehand to the preparation of the depository and to the plan of arrangement desired. Few depositories, other than those already holding cultural materials, will be found that do not require some renovation or repair. All necessary work of this character should be done as soon as arrangements for the use of the depository are concluded. Provision should also be made in advance for such items as emergency fire protection, telephone installation, and special equipment for the handling or storing of containers. If shelving is to be used, detailed and exact figures on sizes and amounts should be obtained and provision should be made for its installation. Because of the danger of dampness to most materials containers should not be placed directly on basement floors. Frames at least 6 inches high on which the containers can be placed should be installed before the transfer begins.

The plan of arrangement to be followed in storage will be limited to some extent by the nature of the depository and by the character of the material stored. A complete plan showing the disposition of each collection should be perfected and the staff members responsible for the supervision of the transfer should adapt the sequence of shipments to it. Material to be placed in dead storage will naturally be assigned to the least accessible portions of the repository. Ordinarily some facilities should be provided for the use of personnel and guards stationed at the depository.

Material valuable enough to justify the expense and labor of evacuation should not be placed in storage and then forgotten. To guard against the danger of dampness and pests, periodic examinations of the material should be made. A definite routine of checking should

be established and in all cases a record should be made of findings. Until it is certain that atmospheric conditions in the depository have been stabilized it is important, particularly in basement depositories, that a daily check be made of the relative humidity. This can be done easily by use of a wet and dry bulb thermometer. Whenever the relative humidity exceeds 55 or 60 percent, a dangerous condition is indicated, and steps should be taken immediately to correct the situation. When conditions are known to be stable, a check of the relative humidity once a week should be sufficient.

Officials who have sent collections to emergency storage should also guard against their possible loss by fire or theft. Fire-fighting equipment will be determined by the location and construction of the depository. Personnel in charge of the materials should be trained in its use. All doors and windows should be supplied with suitable locks, and, if possible, guard service after working hours should be provided.

#### **Library and archival material**

For packing and storing books, manuscripts, and archives, collapsible cardboard boxes should prove satisfactory if expertly packed and transported in protected vehicles. In addition to such boxes the British Museum in evacuating its holdings used a collapsible plywood box, 24 x 18 x 12 inches in size, fastened with screws and with top and bottom removable. Such containers can be stacked in tiers on their sides and, with either top or bottom removed, serve as shelves in the depository. If this is desired the volumes must be packed in such manner as to be accessible when the box is opened. Somewhat similar containers have been used by the Library of Congress.

A first rule in the management of archives and manuscripts is that utmost care must be exercised to protect the files from the danger of disarrangement. This caution should be borne in mind when containers are selected. When practical it is wise to transfer records in their original containers and thus reduce to a minimum the handling of the papers themselves. The limitations of transport and storage facilities and the additional labor and equipment necessary to move such containers as four-drawer filing cabinets must, however, be considered in this connection.

All containers should be packed tightly, although undue strain on the records or books should be avoided. When necessary the sides or ends of packing boxes or cases should be filled with crumpled paper. Books will be subjected to least strain if packed flat. Maps that cannot be packed flat may be rolled and tied and inserted in cardboard tubes. Rare and especially valuable volumes may be wrapped individually before packing.

Books require an even temperature in storage. British authorities recommend that boxes of books, manuscripts, prints, or drawings (except those in solander boxes) be opened and perhaps shelved. Sealed packages in storage are not recommended partly because of the danger from dampness. Several American experts, however, recommend that rare books should not be unpacked while in storage because of possible damage that may result from improper handling.

#### **Museum material**

The obsolete metal cases known as Cambridge cans are suitable containers for the evacuation of much museum material. Many ob-

jects will require special consideration. Bottles may be transported short distances by truck if protected by paper wadding and thin wooden slats. For extended distances bottle trays should be used. Some objects will probably require the use of packing boxes equipped with trays to which the specimens can be attached. Since semiskilled labor can assemble these boxes faster than they can be packed carefully, only a small number need be completely assembled beforehand. The sides, ends, tops, and bottoms should be constructed in advance. Boxes of this type may be made of  $\frac{7}{8}$ -inch pine in the following recommended sizes: 18 x 24 x 6 inches, 24 x 24 x 6 inches, and 24 x 30 x 6 inches. The sides, top and bottom, and ends should be waterproofed before assembling; all boards should be edge-jointed with corrugated metal fasteners, and the tops should be fastened with screws. For the packing of fragile industrial materials, plywood trays equipped with center braces may be used with the boxes described above. These trays should be of proper size to permit the use of sponge-rubber or other similar guards between tray and box. If necessary, the objects can be laced to the trays with proper support. Large and indestructible objects such as machines can be greased and wrapped in waterproofed tarpaulins and bolted to skids or heavy battened bases. Fragile parts should be padded.

Most dried invertebrates if stored in boxes may be protected by crumpled tissue paper and transported in ordinary packing cases. If the specimens are in trays they may be inserted in cloth bags and packed in small wooden boxes. Those which are too fragile for such treatment should be handled separately.

Bird skins should be wrapped in a strong uncoated paper; a good tissue is desirable although newspaper will serve. The paper should be rolled into a cone of the proper size to receive the skin and after the bird is in place the open end should be folded over the tail. The specimen should then be packed in a wooden box, fitted with partitions to prevent injury from weight. Mammal skins require similar treatment, except that they should be placed in paper tubes instead of cones. Hides may be folded with several layers of paper and fumigant between each fold. Mammal skulls when small may be placed in paper tubes. To prevent motion a small fold of tissue should be placed in the tube. Small skeletons and skulls need similar care. Large skulls or skeletons will require individual boxing.

The protection of collections preserved in alcohol is a difficult problem since the alcohol with its dissolved greases is highly inflammable. The collection may be broken into smaller units, though at the risk of producing more but smaller fires. One means of storing such collections is to dump the contents of each bottle into individual muslin bags, which can then be immersed on wire racks or baskets in open-mouthed steel tanks or drums coated with bakelite inside. An alternate procedure is to bury the bottles or the drums in pits covered with sand. This method, however, will render the collections inaccessible.

Furniture exhibits, especially of veneered or marquetry furniture, should be stored in rooms of even temperature and humidity to prevent warping. The use of seaweed matting or asbestos or waterproof coverings will give some protection against extremes of humidity and temperature. A desiccating agent such as anhydrous calcium

chloride can be used to reduce excessive humidity. Textiles hung in the same room will help to prevent sharp changes in humidity.

### Pictures

Most American curators agree that the precautions outlined by the British Museum for the packing, transporting, and storing of pictures are applicable to American conditions. These precautions are repeated here:

"Large numbers of pictures are best packed in railway containers, so that they travel from door to door without disturbance. The floor of the container should be covered with sponge rubber matting  $\frac{1}{2}$  inch in thickness, or with mattresses. The pictures are then loaded vertically, in the direction of travel. In order to avoid abrasion, they must be kept apart. This may be done by means of pads of sponge rubber of dimensions 3 inches by 3 inches by  $\frac{1}{2}$  inch, joined by adhesive tape and hung loosely over the corners of pictures. Rubber contains a certain amount of sulphur and should therefore not come into direct contact with the painted surface. If pictures are packed in their back flats, this will not occur.

"Between every three or four pictures a light wooden framework partition should be placed and attached by rails at each end to the next partition. This will assist speed of unpacking and prevent pressure. Between the ends of the pictures and the back and front of the container sacks stuffed with some resilient material, such as straw or crumpled paper, should be placed to absorb shocks.

"Another method of packing paintings on canvas is to attach corks of about  $\frac{1}{2}$  inch in thickness to each corner of the front of a picture with panel pins (i. e., pins pointed at both ends), and then to place it face to face with another. Bundles can be made of, say, six canvases protected with two sheets of plywood, and covered in water-proof paper. This method should only be used where there is a number of pictures of the same size to be packed.

"The above methods are dependent upon intelligent handling, both in the packing and the unpacking of pictures. Where this is not available, it is advisable to pack pictures in wooden cases or crates suitably lined. \* \* \*

"At least three check lists should be made of the contents of each container as it is packed. One should be retained at the dispatching end, another forwarded to the place of storage, and a third packed into a container with the pictures. Where sufficient clerical assistance is available, it is advisable that an index should be compiled, each picture having its separate card, upon which its condition, both at time of packing and on subsequent inspection, and any other information may be entered.

"Tempera paintings on plaster should be packed separately, each in its own frame and in a separate crate.

"Water-colours should, if possible, be kept permanently in standard-size mounts and frames. They can then be easily unframed and transferred to solander boxes for transport. To protect the surface from scratches, a sheet of transparent foil ('cellophane') should be placed over the water-colour, and held in position by the outer part of the hinged mount. To minimise the danger of moulds, a sheet of thymo-

lised paper should be packed in each solander box.<sup>1</sup> A contents list should be placed in each box, and two others kept for reference (see above). If the boxes cannot be kept in locked cupboards or a safe, each should at least be fastened with a seal.

"Very large water-colours are safest if left in their frames, the glass being protected by pasting paper over the surface. Where there is a number of them, those of approximately the same size may be removed from their frames and packed together as above or in bundles wrapped in waterproof paper.

"Miniatures should be packed in wooden or metal boxes fitted with flat baize or felt-lined drawers. If these are not available, they may be packed in trays in strong boxes, with thick sheets of cotton-wool between each layer. The boxes should be fitted with locks, and lists of the contents should be kept for reference."<sup>2</sup>

Certain modifications of the precautions indicated above have been suggested. Large paintings, if necessary, may be rolled face out on improvised wooden drums and covered with muslin. Between each layer of canvas there should be inserted cotton batting or similar spongy material to prevent injury to the painted surface. When the painting is rolled it should be protected with a good grade of waterproof paper.

Medium-sized or small paintings may be removed from their frames and protected with oiled paper or cellophane wrappers prior to boxing. All boxes should be standard size if possible and lined with waterproof material. The boxes should be equipped with division channel strips at the top and bottom, each space to accommodate one panel only. The channel strips may be covered with felt to prevent injury to the surface of the painting. If time and conditions warrant it, outer boxes may be made. These, too, should be lined with waterproof paper.

Water colors need not be removed from their frames. The glass in the frames can be protected by pasting paper or cloth on it. Framed prints or water colors of similar size may be packed in bundles, with corrugated cardboard between each frame. The bundles should be hermetically sealed and placed into wooden cases.

Depending upon available storage space, pictures can be kept in their frames and hung on screens or removed from their frames in their backboards and stored side by side in racks off the floor. Miniatures and water colors should not be exposed to light. Temperature and humidity should be rigidly controlled. Since pictures in storage must be inspected regularly, each should be clearly identified and easily removed from its rack.

To check on deterioration, photographs taken when the paintings are placed in storage will be useful.

<sup>1</sup>Thymolised paper is prepared by crushing some thymol crystals and ironing them into sheet of tissue, blotting or other paper, which when placed in a solander box from which there will not be particularly rapid evaporation, should retain their disinfectant property for about 6 months.

<sup>2</sup>*Air Raid Precautions in Museums, Picture Galleries and Libraries*, 50-53 (Printed by order of the Trustees, The British Museum, London, 1939).

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**Air raid precautions in museums, picture galleries, and libraries.** Printed by order of the Trustees, The British Museum. [London] 1939. 59 p.

Perhaps the best introduction to the problem. It embodies the report of a committee representing the national museums, picture galleries, and libraries, set up at the instance of the Standing Commission for Museums and Galleries, and is designed to serve as a guide in safeguarding collections, premises, and staffs while on duty. Most of the recommendations prescribed in chapters 1, "Staffs," and 2, "Buildings," are taken from the series of air-raid precautions handbooks and memoranda issued by the Home Office. Chapter 3, "Material," has been compiled chiefly from the experience of the directors of the museums, galleries, and libraries and from the researches of their staffs. For a review, see *Museums journal*, 39:269-270 (Aug. 1939).

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**Architectural Forum.** January 1942.

The entire issue is a "Civilian Defense Reference Number," with articles on blackout, camouflage building protection, air-raid shelters, and civilian defense buildings. It also has a bibliography. Very useful.

**Association of American Railroads, Freight Container Bureau.** The A B C of good crating. New York, 1927. 16 p. (*Bulletin* no. 6.)

**Association of American Railroads, Freight Container Bureau.** A guide to good construction of nailed wooden boxes. New York, 1930. 23 p. (*Bulletin* no. 14.)

**Bemrose, Geoffrey.** Tea chests for storage. *Museums journal*, 39:333 (Oct. 1939).

A note suggesting the use of tea chests to store pottery.

**Bendikson, Lodewyk.** Need for safety measures. *Library journal*, 65:774 (Oct. 1, 1940).

Urges immediate action for the microcopying of documentary treasures in order to insure the preservation of their texts and to have copies available for use when the originals are stored.

**Books in air raids.** *Library journal*, 65:1040 (Dec. 1, 1940).

Reprint of a communication in *Library Association record* for Oct. 1940 on the salvage of books after air raids.

**British Museum (Natural History) air raid damage.** *Nature*, 147:20 (Jan. 11, 1941).

**British Records Association.** Proceedings, 1939, 1940. [London, 1940-41.] 2 nos.

The number for 1939 contains (p. 5-8) an account of an informal discussion relating to "Records in war time," and that for 1940 contains (p. 6-8) an account of an informal discussion on "Local work for preservation of records in war time," relating in large part to the prevention of the destruction of records to meet the demand for waste paper.

**British Records Association, Records Preservation Section.** Report, 1938/39, 1939/40. [London, 1939-40.] 2 nos.

The first of these reports contains a paragraph on the campaign to prevent the "indiscriminate destruction which took place in 1916-1918, upon the national call for waste paper"; the second notes the progress of the campaign.

**British Records Association, Technical Section.** Bulletin 12. [London] 1941. 9 p., processed.

Includes (p. 3-6) information on the treatment of documents damaged by water, fire, and gas and on the restoration of faded ink and (p. 6-7) a communication from Hilary Jenkinson describing the "Effects of surrounding conflagration on the contents of a city strong room."

**Burkard, Hans.** Die Frage des Luftschutzes für Archive und Akteien. *Archivalische Zeitschrift*, 44:172-180 (1936).

A detailed discussion, with recommendations, of the problems presented to archivists by air warfare, including the location and construction of buildings for archives, suitable evacuation areas, fireproofing, and other means of protection against fire, and means of minimizing damage from explosions and gas.

**Business Historical Society.** The preservation of business records. Boston, 1940. 56 p.

A study prepared by Ralph M. Hower, which indicates why business records should be preserved and what material should be selected for preservation. It also offers suggestions for establishing a preservation program.

**Catalonia** takes steps to preserve art work from destruction. *Museum news*, 14:1 (Jan. 15, 1937).

**Celier, Léonce.** Les mesures de protection contre les bombardements aériens dans les bibliothèques et les archives. Union Française des Organismes de Documentation, *La documentation en France*, 9:3-5 (Jan. 1940).

**Derby museum; war precautions.** *Museums journal*, 39:462 (Feb. 1940).

A short statement on storage of pictures and ceramic collections.



Les **études** de l'Office International des Musées et la protection des monuments et oeuvres d'art en temps de guerre. *Mouseion*, supp., Apr. 1938, p. 1-3.

Includes a list of works on the subject published by the office.

**L'évacuation** de Louvre. *Prométhée*, 20: 256-259 (Oct. 1939).

**Flower, C. T.** War conditions and record work; problems affecting archivists. British Records Association, Technical Section, *Bulletin*, no. 7, p. 3-4 (Oct. 1939).

Reports air-raid precautions taken by the Public Record Office and makes suggestions about evacuation; refers for detail to the handbook *Air raid precautions in museums, picture galleries and libraries*.

**Foundoukidis, Euripide.** L'Office International des Musées et la protection des monuments et oeuvres d'art en temps de guerre. *Mouseion*, vol. 35-36, p. 187-200 (1936).

**French** museums and the war; early precautions and present activities. *Museums journal*, 39: 418-419 (Jan. 1940).

Discusses protection of paintings, sculpture, glassware, and monuments.

**Glover, C. W.** Civil defense. Brooklyn, 1941. 794 p.

Reprint of third edition published in London, March 1941.

**Graf, John E.** Emergency protection measures for museums. *Museum news*, 19: 8-9 (June 15, 1941).

**Grant, Julius.** The preservation of documentary records in wartime and in the future. *Librarian*, 30: 12, 24-27 (Sept.-Oct. 1940).

Discusses the problem of paper quality in wartime and precautions against air raids.

**Graswinkel, D. P. M.** Bescherming van archieven tegen oorlogsgevaar. *Nederlandsch archievenblad*, 46: 51-62 (1938).

Includes recommendations regarding storage space, removal of records, and neutralization of materials contaminated with mustard and similar gases.

**Greene, Sir Wilfrid.** Preservation of records. *Library Association record*, 41: 563 (Nov. 1939).

Call of the Master of the Rolls to defend records against the demand for waste paper in wartime. This letter was printed and widely distributed by the British Records Association.

**Hall, Hubert.** British archives and the sources for the history of the World War. London, 1925. 445 p. (*Economic and social history of the World War, British series*.)

Hidden away in the text are scattered references to British experiences in the last war, e. g., "weeding" of records for waste paper (p. 25 et seq.). The volume is incompletely indexed.

**Hammer, Franz.** Luftschutz in Bibliotheken. *Zentralblatt für Bibliothekswesen*, 52: 496-505 (1935).

The **Hancock** Museum and the war; emergency work at Newcastle upon Tyne. *Museums journal*, 39: 357-358 (Nov. 1939).

An illustrated article describing plans made and carried out by the museum.

**International Museums Office, Paris.** La protection des monuments et oeuvres d'art en temps de guerre. Paris, 1939. 232 p.

This manual, reprinted from *Mauseion*, vol. 47-48, nos. 3-4 (1939), was distributed late in November or early in December 1939. It is divided into two parts: "Méthodes techniques de protection," which is most useful, and "Protection internationale," which now makes sorry reading.

**Jenkinson, Hilary.** The choice of records for preservation; some practical hints. *Library Association record*, 41:543-544 (Nov. 1939).

Intended as a guide for the selection of record material for preservation from pulping.

**Jenkinson, Hilary.** A manual of archive administration. New and rev. ed. London, 1937. 256 p.

Has short paragraphs on evacuation, subterranean vaults, fire, and explosive bombs (p. 45, 49).

**Kenyon, Sir Frederic.** La protection du patrimoine artistique en Espagne. *Museion*, vol. 37-38, p. 183-192 (1937).

**Kühn, Karl F.** Fleigerschutz für Kunst und Kulturdenkmäler. Bruenn, 1939. 58 p.

**Laer, Hermann von.** Luftschutz im Dienste des deutschen Kunstbesitzes. *Der deutsche Verwaltungsbeamte*, 1935, p. 749.

This has not been available for examination.

**Leland, Waldo G.** The archivist in times of emergency. *American archivist*, 4:1-12 (Jan. 1941).

Address of the president of the Society of American Archivists read at the annual meeting, Nov. 12, 1940, in which he discusses the responsibility of the archivist for the safety of the records in his custody and for their interpretation and the opportunity for leadership on the part of the archivist in the collection and preservation of materials upon which the history of the emergency will be based. He closes with a summary in which he offers a program for the society.

**Leroy, Emile.** French libraries and the war. *Journal of documentary reproduction*, 3:124-127 (June 1940).

Protective measures taken to safeguard French libraries and their collections from aerial bombing. Refers especially to the activities of the Bibliothèque Nationale and tells of the use of microfilm to insure preservation of an important card catalog.

**Libraries and war; a survey.** *Library Association record*, 41:508-512 (Oct. 1939).

Summary of the repercussions of war on all kinds of library work in Great Britain.

**Libraries in bombed centres; some reports.** *Library review*, 7:318-325 (Winter 1940).

Air-raid experiences.

**Libraries in France and Great Britain during the war.** *Intellectual co-operation bulletin*, 1940, no. 1-2, p. 42-46.

Describes some of the procedures followed by libraries in evaluating valuable material.

**Library photography.** *Library journal*, 65:980 (Nov. 15, 1940).

Includes a paragraph on the effect of a bomb explosion on "a safe of parish records."

Les mesures de protection prises dans différents pays contre les dangers de la guerre. *Mouseion*, supp., Sept.-Oct. 1939, p. 13-22.

This compilation of the International Museums Office summarizes measures taken in Belgium, the Netherlands, Switzerland, Greece, France, Great Britain, Germany, Egypt, and Norway to protect their cultural treasures.

Les mesures prises en Belgique pour protéger les musées contre les dangers de guerre. *Mouseion*, supp., Nov. 1939, p. 1-3.

**Meyer, Herbert.** Air raid precautions for record offices, libraries, and museums. *Library Association record*, 40: 204-209 (May 1938).

Abridged translation by W. F. Wright of an article in the Jan. 1938 issue of *Gasschutz und Luftschutz* (Zeitschrift für das gesamte Gebiet des Gas- und Luftschatzes der Zivilbevölkerung). A general discussion of air-raid precautions, including the location and construction of buildings, the fireproofing of unprotected timber, and plans for the transfer of material to protective storage.

Les musées britanniques et la guerre. *Mouseion*, supp., Dec. 1939. p. 15-16.

Describes measures taken by certain museums to protect their collections.

**Museums in a neutral country; war-time precautions in Belgium.**

*Museums journal*, 39: 485-486 (Mar. 1940).

A résumé of an article in *Mouseion*.

**Museums in war-time.** *Museums journal*, 39: 318-320 (Oct. 1939).

A memorandum by the Museums Association containing suggestions on the protection of collections.

**National Fire Protection Association.** Fire defense; a compilation of available material on air-set fires, bombs and sabotage, civilian defense, fire fighting, and the safeguarding of industrial production for defense, edited by Horatio Bond. Boston [1941]. 221 p.

**National Fire Protection Association.** A study of record container performance. Boston, 1940. 13 p.

Reprinted from the association's *Quarterly* for Jan. 1940.

**National Fire Protection Association, Committee on Protection of Records.** Protection of records; consolidated reports. Boston, 1939. 88 p.

Reprinted from *Proceedings* of annual meetings, 1923-39. Contains valuable information concerning the fire resistance qualities of buildings, record containers, and safes and vaults. Also discusses principles for the selection of business records for disposal, which might be applicable under emergency conditions.

**Navarro, Thomás.** La protection des archives et bibliothèques espagnoles pendant la guerre. International Federation of Library Associations, *Publications*, 10: 110-113 (1938).

**Norton, Margaret C.** Archives and war. *Illinois libraries*, 23: 17-19 (Feb. 1941).

On the importance of the preservation of records "essential to citizenship and property rights."

**Notes and news.** *Library review*, 7: 309-310 (autumn 1940).

Discussion of the suggestion that old newspapers, periodicals, and books of the British Museum and other libraries be microcopied to reduce their bulk and release the originals for waste paper.

- Orne, Jerrold.** The Library of Congress prepares for emergencies. American Library Association, *Bulletin*, 35:341-348 (June 1941).  
Describes in considerable detail plans and preliminary measures taken for the safeguarding of materials of varying degrees of importance.
- Poulton, Dennis.** The blitz and building. *Architect's Journal*, Jan. 23, 1941, p. 58-61.
- Prentiss, Augustin M.** Civil air defense; a treatise on the protection of the civil population against air attack. New York [1941]. 334 p.  
A member of the General Staff Corps of the U. S. Army describes "methods, equipment, and organization" for "protecting the population and industrial, business, and home property" against air attack.
- La **protection** des monuments et objets historiques et artistiques contre les destructions de la guerre; proposition de la Société Néerlandaise d'Archéologie. *Mouseion*, vol. 39-40, p. 81-89 (1937).
- La **protection** des monuments et œuvres d'art au cours de la guerre. *Mouseion*, supp., Jan. 1940, p. 4-5.  
This is a French version of instructions issued by the German Minister of Aviation, Aug. 26, 1939, to museums, libraries, archives, and other cultural agencies.
- Protection** of office records in wartime by a borough treasurer. *Municipal journal*, 48:2113 (Sept. 29, 1939).
- Rabut, J.** La construction des dépôts d'archives et la défense passive. *Archives et bibliothèques*, 4: 89-97 (1939).  
A valuable article by an engineer discussing not only problems of the location and construction of archival buildings from the point of view of protection against the hazards of war but also those of the evacuation, transportation, and preservation in storage shelters of archival material.
- Renau, José.** L'organisation de la défense du patrimoine artistique et historique espagnol pendant la guerre civile. 1937. 66 p.  
Reprint from *Mouseion*, vol. 39-40 (1937). A useful work, especially for its plates and diagrams.
- Ronart, O.** Le danger aérien et la sauvegarde des objets d'art aux Pays-Bas. *Revue générale de droit aérien*, 8:59-75 (Jan.-Mar. 1939).
- Rosegrant, Robert G.** The preservation of museum collections during war. *Museum news*, 19:9-12 (June 15, 1941).
- Russell, John R.** Libraries under fire. American Library Association, *Bulletin*, 35:277-281 (May 1941).  
Discusses chiefly the damage to libraries in England resulting from air raids. Also contains some information on precautionary measures for the protection of collections.
- Safety** of collections in coastal areas. *Museums journal*, 40:180 (Sept. 1940).  
The British Minister of Home Security recommends the evacuation of collections along the eastern and southern coasts of England.
- Sánchez Cantón, Francisco J.** Les premières mesures de défense du Prado au cours de la guerre civile en Espagne. *Mouseion*, vol. 39-40, p. 67-73 (1937).

La **sauvegarde** des objets historiques ou folkloriques. *Mouseion*, supp., Apr. 1940, p. 2.

**Smith, Sherwood B.** Air raids and protective construction. *Military engineer*, 33:287-293 (July-Aug. 1941).

An engineer describes types of aerial bombs and their more important effects and discusses measures that may be taken to protect the civil population and minimize damage.

**Stix, Alfred.** La défense de musées en cas d'attaques aériennes. *Mouseion*, vol. 39-40, p. 75-80 (1937).

**Sweden, Riksarkivet.** Meddelanden, 1939. Stockholm, 1940. 158 p.  
Includes (p. 1) a brief description of measures preparatory to the evacuation of archival materials in wartime.

**Taylor, W. D., and Henry J. Walls.** A new method for the decipherment of charred documents. *Nature*, 147:417 (Apr. 5, 1941).

Describes a simple and generally applicable method equally suitable for typescript and for printed matter developed by the Metropolitan Police Laboratory in London.

**Turner, William A.** Public libraries in wartime. *Library Association record*, 41:508-512 (Oct. 1939).

Recapitulation of possible and probable effects of war on libraries.

**U. S., Emergency Management Office, State and Local Cooperation Division.** Civilian defense; protective construction; prepared by the War Department with the advice and assistance of other Federal agencies. Washington [1941]. 36 p. (*Structures series, Bulletin* no. 1.)

Discusses in detail such matters as the effects of bombs on buildings, the protection of buildings, and the design of new buildings to resist bombing effects.

**U. S., Library of Congress.** Report on the precautionary measures regarding its collections adopted by the Library of Congress; prepared by the Special Assistant to the Librarian, Jerrold Orne; June 1941. [Washington, 1941.] 25 p., processed.

**U. S., National Park Service.** Field manual for museums. Washington [1941]. 426 p.

Contains (ch. 7) valuable information on technical methods for the cleaning and repair of museum materials, which should be helpful in the restoration of materials damaged in wartime.

**U. S., National Park Service.** Observations concerning the conservation of monuments in Europe and America; [by] Dr. Hans Huth, collaborator. Washington, 1940. 64 p., processed.

Section 3 (p. 42-51) is entitled "Protection of monuments in wartime." It deals generally with methods for the protection of cultural materials.

**U. S., National Park Service.** Packing museum exhibits and collections for shipping and storage; [by] Ned J. Burns, Chief, Museum Division. [Washington, 1942.], 11 pp., processed.

**U. S., Work Projects Administration, District of Columbia.** Bibliography of air raid precautions and civil defense. Washington, 1941. 343 p., processed.

**Valencia, Junta Central del Tesoro Artístico.** Protección del tesoro bibliográfico nacional. Valencia, 1937.

This pamphlet has not been available for examination.

**Visscher, Charles de.** La protection internationale des monuments historiques et des oeuvres d'art en temps de guerre. *Mouscion*, vol. 35-36, p. 177-185 (1936).

**Wachtel, Curt.** Air-raid defense (civilian). Brooklyn, 1941. 240 p.  
Measures and methods of air-raid defense that are practiced in Europe and that have been tested and proven practical, presented by a scientist with long experience abroad.

**The War on books; library losses in England.** *Bulletins from Britain*, no. 36, supp., May 7, 1941.

Contains information concerning losses to particular libraries and collections as a result of air raids.

**Wartime activities in museums.** *Museums journal*, 39:328-330 (Oct. 1939).

Includes brief notes on the protection of material.

**Wessman, Harold, and William A. Rose.** Aerial bombardment protection. New York, 1942. 372 p.

A technical engineering treatise.

**Wright, W. F.** Air raid precautions for the library. *Library Association record*, 40:510-512 (Oct. 1938).

The dangers to be guarded against and methods of protection.

**Year's work in archives, 1938, 1939/40** [London] 1939-40. 2 nos.

Prepared and issued by the British Records Association. The number for 1938 appeared as no. 9 in the association's series of *Reprints*. Both numbers include data on the protection of records in wartime, and the number for 1939/40 contains a description (p. 5) of the work of evacuation and air raid precautions at the Public Record Office.

**Youngs, Willard O.** Wartime activities of British libraries. California Library Association, *Bulletin*, 2:115-116 (Dec. 1940).

Based on material in the *Library Association record* for July 1940.

**Zernik, Franz.** Über den Einfluss von Gaskampfstoffen auf Archivalien. *Archivalische Zeitschrift*, 44:181-185 (1936).

A technical discussion of various types of gases, their effects on archival materials, and the means of counteracting those effects.



